ESIA – Forestal VillaBaro

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Prepared for:

ARBARO FUND

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1 INTRODUCTION

The purpose of this document is to present the Environmental and Social Impact Assessment (hereinafter ESIA) for the area of the pine plantations associated with the site called "Villanueva Operational Area" (hereinafter AOVN), located in the municipality of Villanueva, in the department of Casanare, in Colombia, which is owned by Reforestadora de la Costa S.A.S. ("Refocosta").

The AOVN has a total area of 3,495 hectares, and includes operations that are outside the scope of this project. The AOVN is located towards the northern sector of the municipality, adjacent to the urban area of the municipality, in an area known as the Meseta de San Jorge. The operation is distributed in three main properties (farms), called Huerta La Grande, El Delirio and La Aurora. These are all located within the municipality of Villanueva and border with several private farms mainly used for livestock and the establishment of agricultural crops.

In this area, the Arbaro fund is in the process of negotiating an alliance with Refocosta to manage the pine plantations located there in order to improve their yields and subsequently sell this harvest back to Refocosta.

Within the total area of the AOVN (3,495 ha), the objective of the purchase process focuses solely on approximately 1,800 ha of pine (*Pinus caribaeae*), as well as the so-called conservation areas, which comprise an additional area of approximately 200 ha, consisting of gallery forests and areas of secondary vegetation located along the different stands that make up the area.

Thus, this document presents a description of the current activities and the main impacts found in this operation, as well as management recommendations, so that Arbaro can make an informed purchasing decision on the current socio-environmental status of the area.

1.1 Background

Refocosta has 40 years of experience in the implementation, management and use of forestry plantations, for which it has two clusters. The first of these, located in the north of the country, called La Gloria, has plantations mainly of Teak (*Tectona grandis*) and Eucalyptus (*Eucalyptus Tereticornis*) in Magdalena and the second is located in the municipality of Villanueva (Casanare), where the main species are Caribbean Pine (*Pinus caribaea*) and Eucalyptus Pellita (*Eucalyptus pellita*). In this regard, it is clarified that the objective of this document corresponds only to the pine plantations located in the Villanueva Operational Area.

Since 2009, the company has been certified by the Forest Stewardship Council (FSC) for all its plantations and in general its forest harvesting process, a certification that has been maintained over time, with the latest revision occurring in 2019.

1.2 Objectives and scope

1.2.1 General objective

Establish the main environmental and social impacts caused by the current operation of approximately 1,800 hectares of commercial pine plantations, and their associated conservation

areas, which comprise an additional 200 ha, as well as the potential expansion as described in Annex 1. This project is established in the operational area of Villanueva in the department of Casanare, (Colombia), from the preparation of the land, up to the moment when the trees arrive at the sawmill gate, including periodic maintenance, forest harvesting and skidding.

1.2.2 Specific objectives

- Describe the main physical characteristics of the area, based on secondary information and field corroboration.
- Identify the current status of the area at the biodiversity level with emphasis on the conservation areas surrounding the plantations.
- Establish the social particularities of the area of influence of the project, both at the institutional level and at the level of the communities in the area and other stakeholders.
- Preliminary identification of environmental, social and legal management restrictions for a possible expansion of plantations within a radius of 10 km.
- Identify the most relevant impacts for the current operation, taking into account the activities identified, the secondary information consulted and the field visit.
- Recommend the management of identified impacts so that they can be prevented, mitigated or compensated for, within the current and future operation of the areas both in planting and maintenance.

1.3 Sources of information

For the preparation of this document, secondary and primary sources of information were consulted. In the first case, national databases were consulted, including: the Tremarctos module (www.tremarctoscolombia.org), the Colombian Environmental Information System - SIAC, the National Administrative Department of Statistics - DANE, and the Institute of Environmental Studies - IDEAM, as well as the National List of Threatened Species (resolution 1912 of 2017). For the social component, the following were consulted: the territorial statistics system of the National Planning Department - DNP, the departmental employment plan of Casanare of the Ministry of Labour, the municipal development plan 2020-2023 "Together we build Villanueva", diagnoses of the health and education sector of the Government of Casanare, economic studies and management reports of the Chamber of Commerce of Casanare, among others.

Likewise, the Villanueva municipality's Land Use Plan (EOT – Esquema de Ordenamiento Territorial) and the Regional Water Resource Management Plan (PORH – Plan de Ordenación Regional del Recurso Hídrico) of the Aguaclara river micro-basin were consulted.

Moreover, Refocosta's public documents and FSC reports were consulted. These include the following:

- Summary of the UOLG-UOVN forest management plan, 2021.
- Monitoring Report 2019-2021

- Environmental Management Plan. Environmental Management Plan sheets
- Environmental impact evaluation, 2019
- Flora and fauna monitoring 2019-2020
- Report on general social impacts that may be generated by the forestry operation, 2021.
- Procedure for managing communication, participation and consultation.

Primary information was collected through interviews with those responsible for the areas considered key or most relevant in the UOVN.

In addition, primary information was collected through a visit to the project area by forestry, environmental, biology and social specialists on 9, 10 and 11 December 2021, where they conducted tours and transects of observations in some of the points considered most important, and conducted interviews with other actors and stakeholders identified within the area of influence of the operation.

2 DESCRIPTION OF THE STUDY

This environmental and social impact study was carried out based on the consultation of the information described above and the evaluation of the main impacts by each of the participating specialists, for which the Leopold matrix was used as a tool, taking into account the activities established in accordance with the scope proposed by Arbaro.

In this way, the document was structured in 10 chapters and one (1) annex, according to the following content:

Chapter 1. Introduction
Chapter 2. Description of the study
Chapter 3. Project description
Chapter 4. Review of relevant socio-environmental issues
Chapter 5. Characterisation of the study area
Chapter 6. Climate change
Chapter 7. Socio-environmental impact assessment
Chapter 8. Management plans
Chapter 9. Recommendations
Chapter 10. Bibliography

Annexes:
Annex 1. Analysis of the expansion area

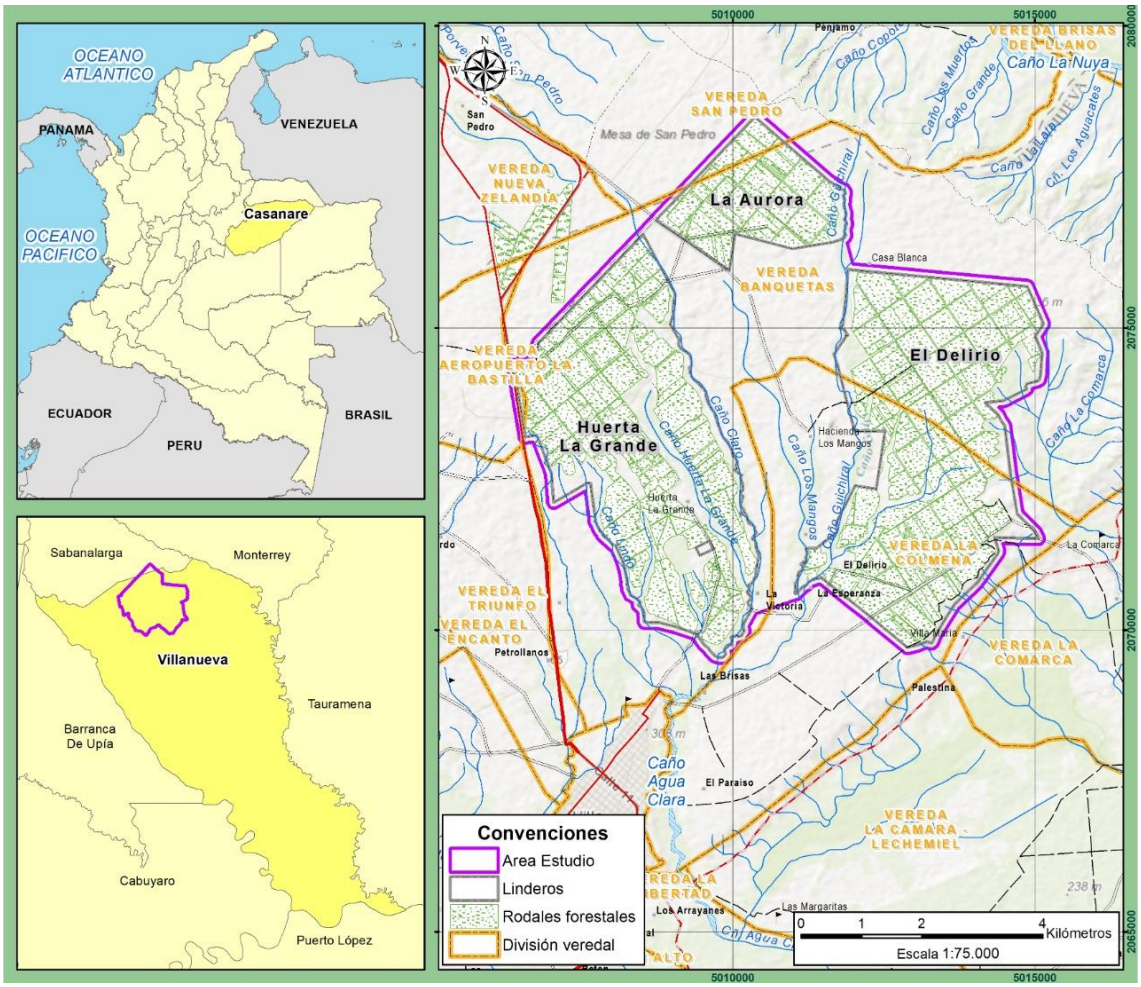
It is also important to highlight that this study was developed by a group of specialists from different disciplines (environmental engineer, forestry engineer, biologist, social professional and expert in geographic information systems), who contributed their technical knowledge and experience both in the description of the main characteristics of the area and in the process of identification and evaluation of impacts and management recommendations.

3 PROJECT DESCRIPTION

3.1 Location

The Refocosta forestry project is located in the municipality of Villanueva in the department of Casanare, in the eastern sector of the country, as shown in the . This company has been operating the project since 1981. The project is distributed in three farms, which are called: Huerta la Grande, where the camp areas and wood processing facilities are located; El Delirio, located in the eastern sector; and a smaller area called La Aurora.

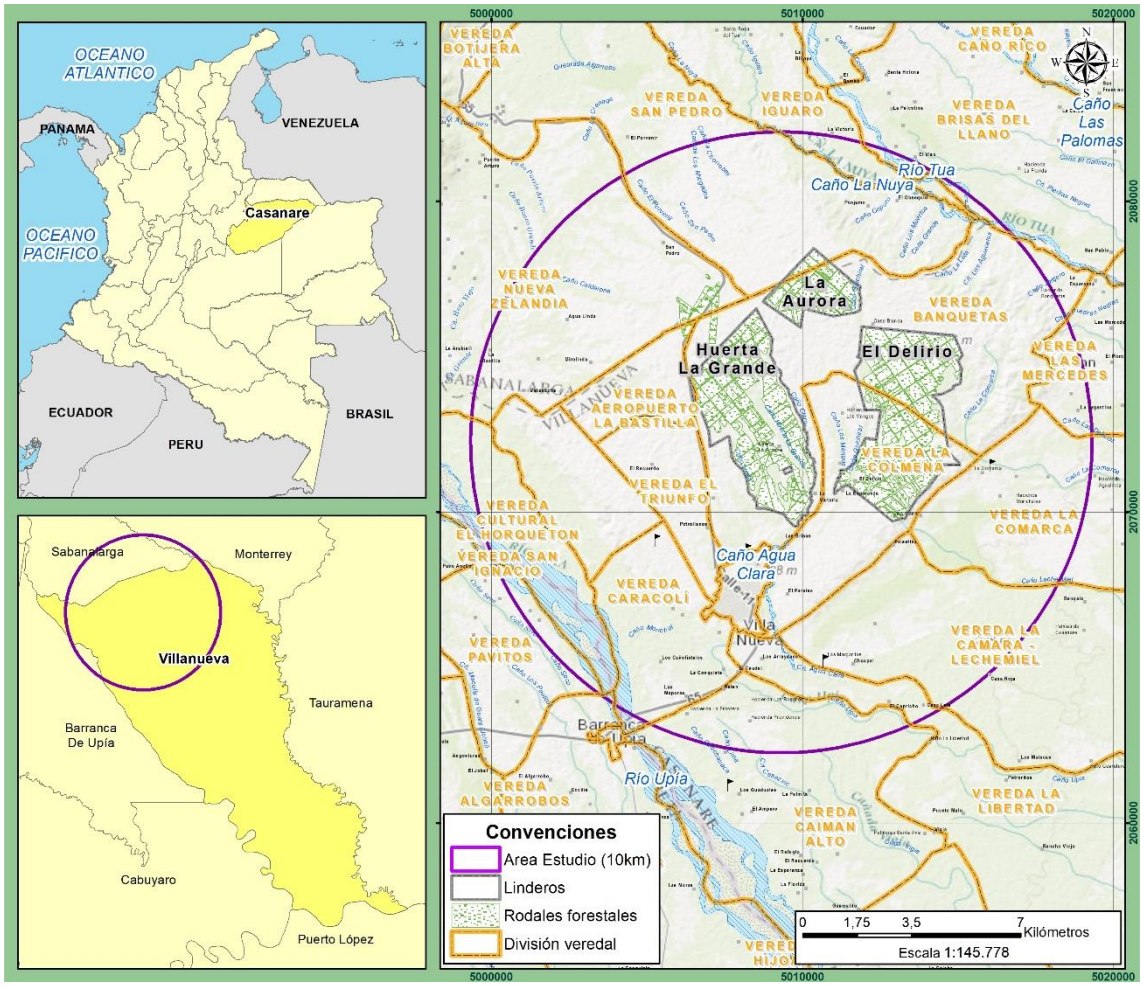
Figure 1 - Location of the project area



Source: SCG,2021

Also, within the present scope, the analysis of probable environmental, social and legal restrictions is contemplated for an area defined by a buffer of 10km from the timber processing zone, which will have an area of at least 200 ha. The study area for this expansion is presented in Figure 2.

Figure 2 - Location of the expansion study area (10 km)



Source: SCG,2021

3.2 Economic activity

The main objective of the forest plantations in the area is the marketing of roundwood and processed timber, for which processing into boards and other products, including drying, is carried out directly on site.

3.3 Description of facilities

Within the three farms there is infrastructure associated with the different operations that take place there, mainly related to the camp area, sawmill areas, storage, clonal orchard and nursery. It is important to mention that none of these are part of the negotiation process. However, they are referenced because they are part of the area where the plantations are located.

The most relevant facilities found are described below:

3.3.1 Camps Area

This is located in a central part of the Huerta la Grande farm, next to the sawmill area, the storage yard and the clonal orchard. In these camps there is office, accommodation and canteen for both staff who live permanently on site and those who live outside and only come to work.

3.3.2 Sawmilling Area

In these facilities, the debarking and sizing of the wood is carried out, for which specialised machinery is used for each of the required cuts. This area includes storage areas for the finished products and also drying chambers for the timber, which is done using a boiler that is fed with the residue from the sawmilling process.

Photo 1 - General view of the sawmill area

Source: SCG, 2021

3.3.3 Storage yard

Next to the sawmill and camps, there is an area used as an open-air storage yard, where harvested logs are stored prior to sizing and cutting. This area is also used for temporary storage of residues or other materials and/or machinery on a temporary basis.

Photo 2 - Panoramic view of the collection area

Source: SCG, 2021

3.3.4 Clonal orchard

This area is located to the south of the previously described areas and it serves for the maintenance, management and extraction of seedlings from clone propagation techniques, which are found in this site.

Photo 3- Clonal orchard area

Source: SCG, 2021

3.3.5 Nursery

This area is isolated from the others, in the south-western part of El Delirio farm. Activities related to the processes of propagation and management of seedlings by seed, prior to planting, are carried out there.

3.4 Description of activities

The following is a general description of each of the activities carried out by the project, corresponding to those of interest within the framework of this study, which ranges from soil preparation to forest harvesting and transport to the sawmill site. For this reason, although the AOVN has nursery and timber processing operations, these activities are not included within the scope of this study.

It is also important to mention that these activities are described based on the document: Summary of the Forest Management Plan (Refocosta, 2021), as well as on the information gathered during the fieldwork days.

3.4.1 Soil preparation

During this stage, the land is prepared prior to the planting. These activities consist mainly of: Tracing and liming of the planting lines, marking, ploughing, acidity correction and planting. These activities are carried out by trained personnel living in the region.

In cases of replanting in which the plots have already had forestry activity, the collection of residues, branches and other waste will be carried out previously with a tractor and special equipment.

3.4.2 Control of unwanted species

Intensive control is carried out on young plantations in order to avoid competition for water, light and nutrients. This activity is aimed at eradicating all broad-leaved weeds and grasses, and is done manually with tools such as machetes, scythes or weed cutters.

Chemicals are also used, consisting of broad-spectrum herbicides such as Glyphosate and Nufuron 60WG, both of which are approved for commercial use. In general, this control is done from the establishment of the plantation until it is four (4) years old. On average, two chemical controls and two manual controls are carried out each year.

3.4.3 Fertilisation

This activity is done to supplement the nutritional requirements of the species in the early stages of life. It typically includes the addition of fertilisers based on Nitrogen, Phosphorus and Potassium, although micronutrients are also added. It is applied incrementally up to year three (3) in doses of 60g (year 1), 90g (year 2), 120g (year 3) per tree. Thus, the periodicity is annual and the application is intended to coincide with the rainy season. For fertilisation, fertiliser mixtures are used with the following compositions: Nitrogen (8%), Phosphorus (20.4%), Potassium (K2O), Magnesium (8%), Calcium, Sulphur, Boron, Copper, Manganese, Zinc, Iron, Silicon.

3.4.4 Plantation

For this activity, the optimum sowing time is sought, which, according to the information consulted, is approximately between the months of June and November. This activity is carried out manually, by trained personnel, ensuring that when the seedling enters the soil, no damage is caused to the root system or the stem.

3.4.5 Pruning

This activity seeks to maintain the optimum shape of each tree, eliminating the presence of branches that over time generate knots in the wood, damaging its aesthetics and mechanical properties. This is done manually by trained personnel who, with the help of extendable tools, remove each of the branches in the early stages of the plantation (between 2 and 4 years old). It is important to mention that the residues are left on the site, so that they are naturally reincorporated into the soil, thus seeking to minimise impacts on this component.

3.4.6 Thinning

Taking into account the growth dynamics of the plantations, the aim is to achieve optimal management of light and nutrient availability, which is why the aim is to concentrate the greatest possible volume of wood in each tree at the end of each rotation. In this way, two thinning operations are carried out. The first will bring the density of individuals from 1,100 trees, which

is the initial density, down to 720 trees/ha. For the second thinning, the final density will be brought to 458 trees per hectare.

3.4.7 Fire control

Fire prevention is mainly carried out through areas that serve as firebreaks, which occur mainly in the dry season and are caused by both anthropogenic and natural factors. Refocosta has implemented the following strategies within its forest management plan.

- Preventive Activities: Maintenance of firebreak areas and removal of vegetation on both sides of the fences.
- Education and Dissemination: Its main objective is to involve the entire working population in the fire prevention programme.
- Provision and Maintenance of Equipment. It is essential to have the necessary tools to effectively prevent and control the presence of fire.
- Fire Control Brigades: To respond in a timely manner to any outbreak that may occur, as well as to assist and support the community.
- Plantation surveillance: Consists of the timely detection of the presence of smoke or fires in plantations or areas bordering the Operational Unit.

3.4.8 Road maintenance

This activity consists of the constant check of the different roads and the use of machinery to maintain adequate conditions for the passage of trucks and the execution of erosion control and geotechnical stability works where required. It is important to mention that, due to the maturity of the project, no new roads are planned.

3.4.9 Fence maintenance

This activity involves the removal of damaged or highly deteriorated sections of fences and their replacement with new fencing. This activity is carried out manually, with the help of tools such as diggers. Barbed wire is used to keep cattle away. This activity is carried out at the edges of the farms, and at some areas destined for protection inside the farm, although there is no longer any livestock activity inside the farm.

3.4.10 Ant control

According to what is described in the forest management plan, pest and disease control in the Villanueva Operational Unit focuses on the control of the Atta ant, which greatly affects the established plantations. This species causes total or partial defoliation, totally damaging the individual or affecting it in such a way as to limit its development. For this reason, chemical methods are used for its control, the main active ingredients of which are Abamectin and Fipronil, for which the respective Environmental and Social Risk Evaluation (ERAS) and the corresponding actions to minimise the risks are in place.

3.4.11 Forest harvesting

Once the planted trees reach the established maturity, based on the expected yield of each stand, they are harvested. This is done by felling all the individuals in each lot, using chainsaws as the main tool. Once each tree is felled, the branches and tips are removed to make it ready for transport.

The plant material corresponding to branches and leaves are left in place, whereupon they are reincorporated into the soil.

3.4.12 Skidding

This activity consists of transporting each of the previously cut trees to the storage yard where they will be transformed in the facilities located within the project. No new roads are opened for this transport, but the existing road network is used.

Transport is mechanised, using both single and double axle trucks, which are loaded mainly with the aid of a crane or hydraulic loader onto each truck.

4 REVIEW OF RELEVANT SOCIO-ENVIRONMENTAL ASPECTS

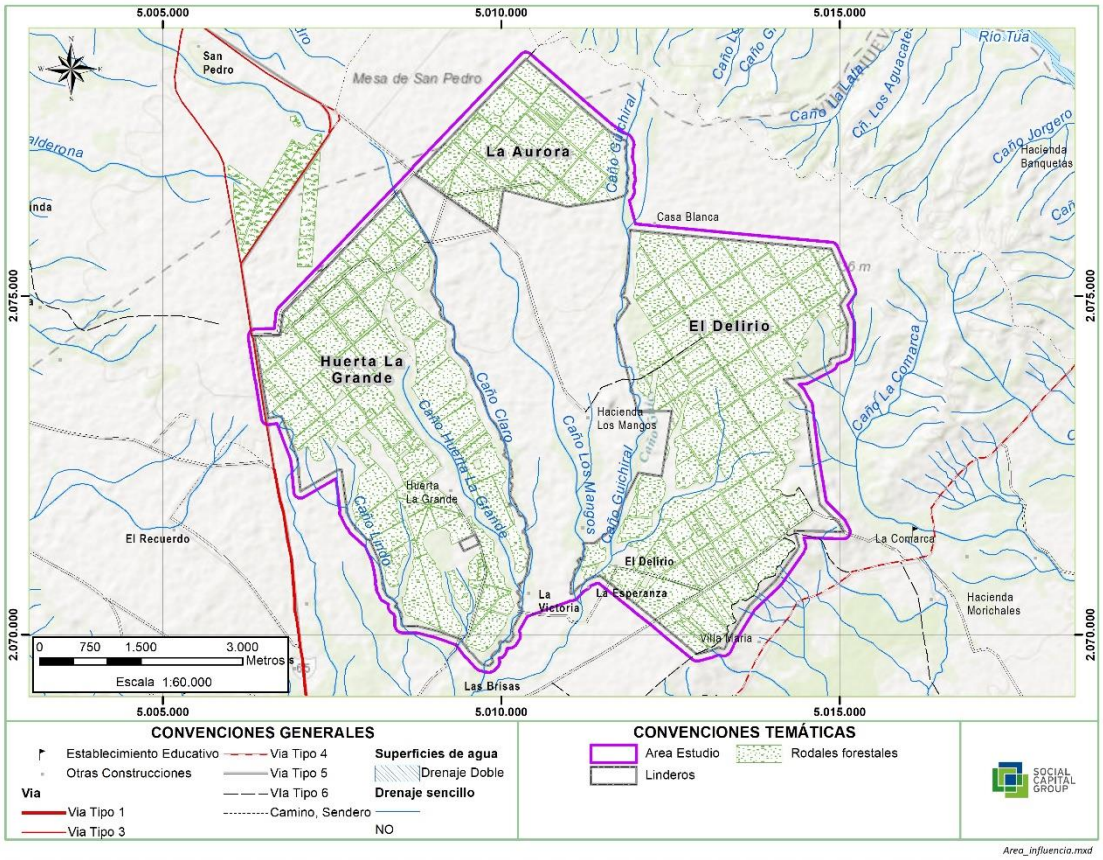
4.1 Area of influence of the project

The area of influence of the project, which is the subject of this study, corresponds to the three properties that make up the Villanueva Operational Unit, called Huerta La Grande, La Aurora and El Delirio, for which a buffer of 100 metres was established around them, as it was considered that the potential impacts do not manifest themselves beyond this distance, since according to what was observed in the field during the visit carried out between 9 and 11 December, the negative impacts related to this project are not significant, so it is not likely that they will exceed the established buffer.

The area of influence, established as the study area, is bordered to the north by the Túa river and the Sabanalarga-Villanueva road; to the west by the same road; to the east by a hilly area and the La Comarca road; and to the south by suburban and urban land in the municipality of Villanueva. In this area of influence, biotic and abiotic characterisation will be carried out (

Figure 3

Figure 3 - Area of influence Villanueva plantation



4.2 Licensed projects in the area

The area of influence overlaps with some hydrocarbon projects which are subject to environmental licensing. In this regard, it is relevant to clarify that according to article 2.2.2.2.3.2.1. of decree 1076 of 2015, the activity of forest plantations does not require an environmental licence, so it is not necessary to carry out an overlap analysis. In any case, in the content of the environmental zoning of these hydrocarbon projects, the forest plantation implies an exclusion of license-required activities.

According to the land map of the National Hydrocarbon Agency, the area overlaps with two polygons of the Llanos sedimentary basin, not yet assigned: LLA131 and LLA31. The latter is in a permanent process of area allocation, and participated in the Colombia 2021 Round. The areas that overlap with the project are: LLA131 at 2,548.92 Ha and LLA31 at 2,542.24 Ha (Figure 4).

With respect to Oil&Gas projects licensed by ANLA, it overlaps with 7 polygons related to this industry (Table 1 and

Figure 5).

Table 1 - Overlap with ANLA projects

File	Operator	Project	State	Overlapping area Ha
LAM5612	PETROMINERALES COLOMBIA LTDA	LLANOS 31- II EXPLORATORY DRILLING AREA.	ACTIVE	2958,01
LAM4751	PETROMINERALES COLOMBIA LTDA	AREA OF INTEREST PLAINS 31	ACTIVE	0,20
LAM5612	PETROMINERALES COLOMBIA LTDA	LLANOS 31- II EXPLORATORY DRILLING AREA.	ACTIVE	1934,26
LAM3509	PETROBRAS COLOMBIA LIMITED	AREA OF INTEREST FOR EXPLORATORY RESEARCH VILLANUEVA	ACTIVE	1934,26
LAM5612	PETROMINERALES COLOMBIA LTDA	LLANOS 31- II EXPLORATORY DRILLING AREA.	ACTIVE	198,70
LAM3509	PETROBRAS COLOMBIA LIMITED	AREA OF INTEREST FOR EXPLORATORY RESEARCH VILLANUEVA	ACTIVE	198,70
LAM0744	EXXON MOBIL DE COLOMBIA S.A.	VILLANUEVA EXPLORATION BLOCK	ARCHIVED	198,70

Source: ANLA, 2021.

Although there are active exploratory drilling projects, their areas are not close to the plantation. According to the land-use planning guidelines and environmental determinants (EOT of Villanueva approved by Municipal Agreement No 010 of 2010), the planted forests and the micro-watersheds within the Villanueva Operational Unit's property are a restriction or exclusion for extractive activities. No future conflicts are foreseen between the drilling projects and the forest plantations of the UOVN.

Figure 4 - Overlay with ANH Land Map

Source: ANH, 2021

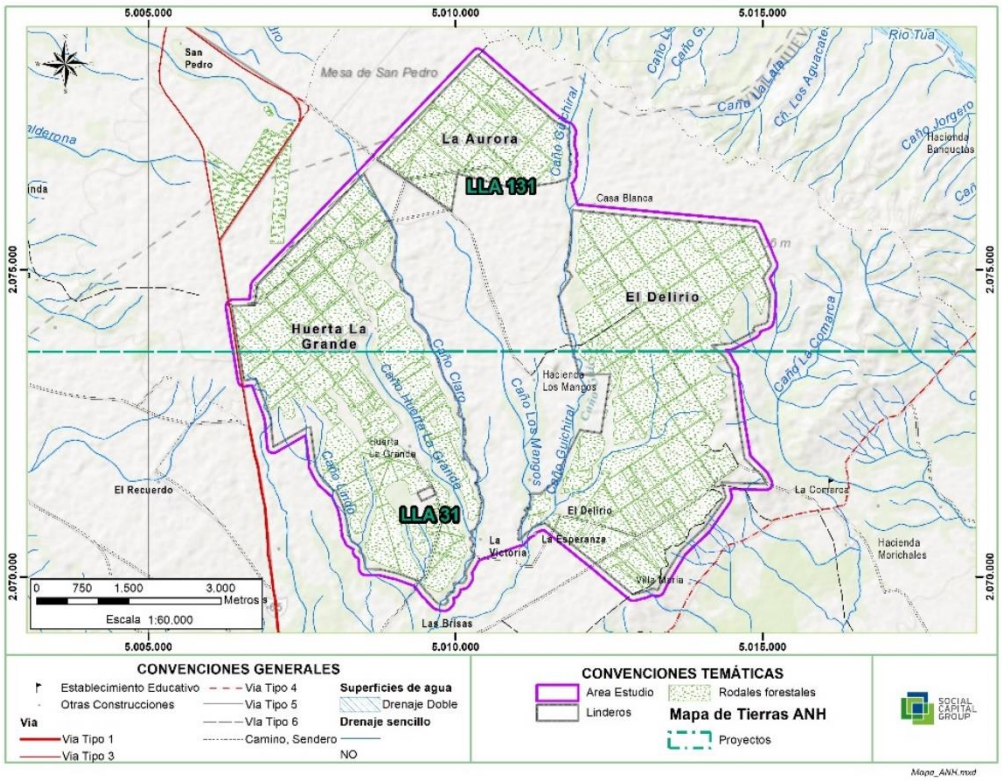
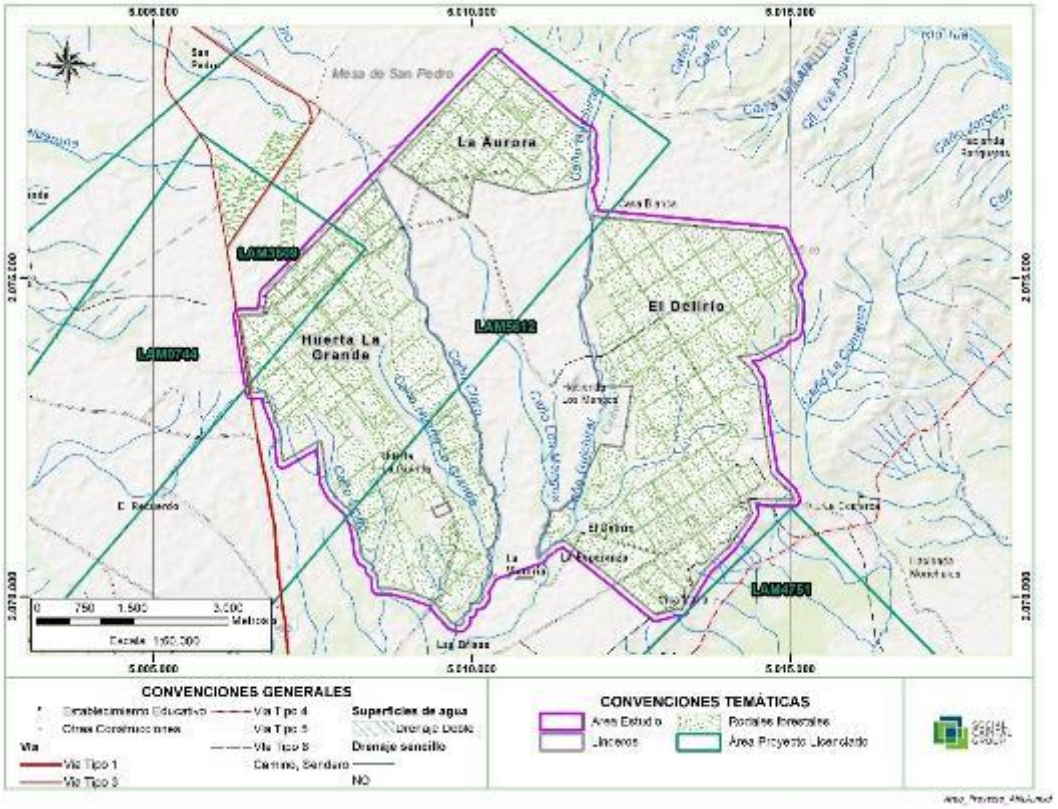


Figure 5 - Overlap with ANLA licensed projects



Source: ANLA, 2021

4.3 Resource use analysis

The Villanueva Operational Unit currently has two permits for the use and exploitation of natural resources in force. On the one hand, the surface water concession for industrial and domestic use granted by Corporinoquia, which has a catchment on a spring in the Huerta La Grande stream where a dam type work with solid particles filter has been installed. This catchment point (spring) is located inside Refocosta's property, and the management given by Refocosta is for conservation purposes. During the field visit, there was evidence of native vegetation conserved in the water course (Photo 4). Water storage is done in above-ground tanks (Photo 5), which have three flow meters, one for each area: sawmill, administrative and living areas.

The second permit is related to atmospheric emissions from the use of the 300 HP steam boiler, which works at 80% of its capacity, and whose fuel is biomass from the plant's wood residues or non-conforming cuts. The boiler has two chimneys, which are periodically monitored for atmospheric emissions, and the emission control systems consist of cyclones for the collection of particulate matter (Photo 6). The ash resulting from the incomplete combustion of biomass is disposed of as organic waste, as stated by the head of industrial operations. The purpose of the boiler is to generate steam for the operation of the wood drying kilns (Photo 7).

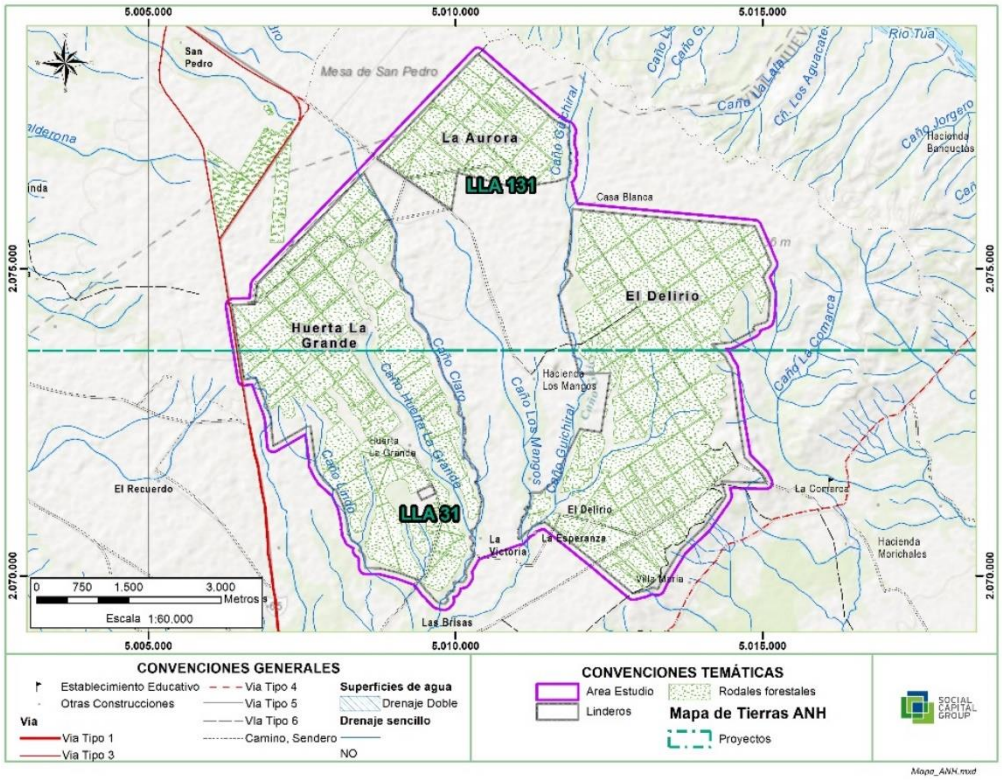
The coordinates of the surface water abstraction points and boiler sites are shown in the table 2 and its location in the Figure 6.

Table 2 - Coordinates of collection points and atmospheric emissions

Point	Coordinates	
	N	O
Huerta La Grande water catchment	5009270,52	2072644,84
Atmospheric emissions	5009248,70	2072249,21

Source: SCG, 2021, based on information collected in the field.

Figure 6 - Resource use in the Villanueva Operational Unit



Source: SCG, 2021, based on information collected in the field.

Photo 4 - Point of capture	Photo 5 - Water storage tanks for domestic and industrial use
	

Photo 6 - Boiler subject of air emissions permit	Photo 7 - Wood drying kilns
	

Source: SCG, 2021, based on information collected in the field.

4.4 Analysis of the Villanueva EOT

The document of the Revision of the Villanueva Land Management Scheme (Alcaldía Municipal de Villanueva y Control Ambiental Consulting, 2014), approved by Municipal Agreement No 010 of 2010, defines the following environmental determinants established by resolution 300.41.13.0191 of 27 February 2013 by the Corporación Autónoma Regional de la Orinoquia - Corporinoquia. Which are:

a) Environmental determinants for the conservation area

In the case of Villanueva this relates to the Meta River Basin, the Upía River sub-basin with an area of 27,795 ha equivalent to 29.5% of the total area of the sub-basin, and the Tua River sub-basin with 53,932 ha equivalent to 29.13% of the total area of the sub-basin. The data is taken from Corporinoquia's 300.41.13.0191 of 27 February 2013.

b) Micro-watersheds supplying municipal aqueducts

According to Resolution 300.41.13.0191 of 27 February 2013 of Corporinoquia in the municipality of Villanueva, the micro-watershed supplying the Huerta La Grande, Agua Clara and Los Mangos streams must be protected. These micro-watersheds are partially located in the area of influence of the project, including the municipal aqueduct intake, which is associated with the Huerta La Grande stream.

c) Special protection areas

The Agua Clara stream buffer area, comprising the valley formed between the edges of the ravine on each side of the stream and from the confluence of the three main tributaries that form it to the junction with the Villanueva - San Agustín road. This stream is located within the area of influence and in an area adjacent to the project, and is of recreational importance to the community. In addition, according to Corporinoquia's 2016-2019 Action Plan PGAR, the Agua Clara stream is a regulated watercourse with PORH with an area of 5,675 hectares.

The Figure 7 shows the ecological structure recognised by the management scheme adopted in 2010, with regard to water bodies.

Regarding the land use regime for these conservation areas, Municipal Agreement No. 010 of 2010 (p. 69), states that "*Any agricultural activity is prohibited in a 100 m strip around these strategic areas; human settlements are restricted around them, polluting discharges are prohibited, whether domestic or industrial, and reforestation plans with native species and natural revegetation will be encouraged. It will be applied to areas supplying aqueducts. (...) It also corresponds to the biological corridors of gallery forests".* This Main Ecological Structure is made up of the following units:

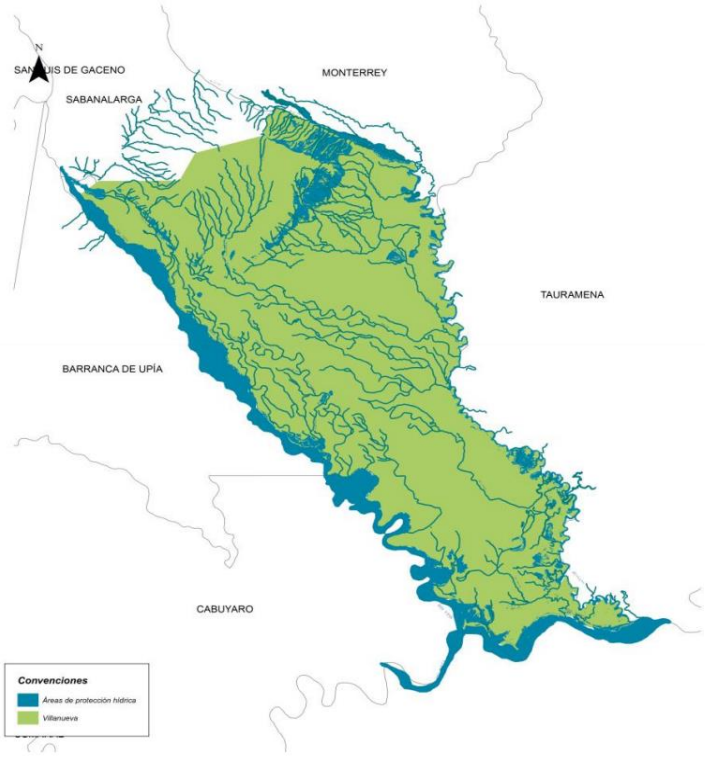
- Environmental conservation treatment (ECT): 100 m around Aguas Claras water bodies and 30 m around other water bodies. 200 m around water sources (e.g. Refocosta intake). With respect to the Huerta La Grande meteorological station within the Villanueva Operational Unit, no infrastructure shall exist within a radius of 100 m.

- Morphological Recovery Treatment (MRT): Biological corridors of gallery forest.

- Integrated management treatment (IMT): Protective forest reserves - stubble-producing reserves associated with subsistence crops and pastures.

- Treatment of environmental impact (TAA): Water catchments. For the national road network: first order roads, 60m; second order roads, 45m; and third order roads, 30m. Taken from the middle of each side of the road axis. Dual carriageway roads, 20 m, on both sides of the road.

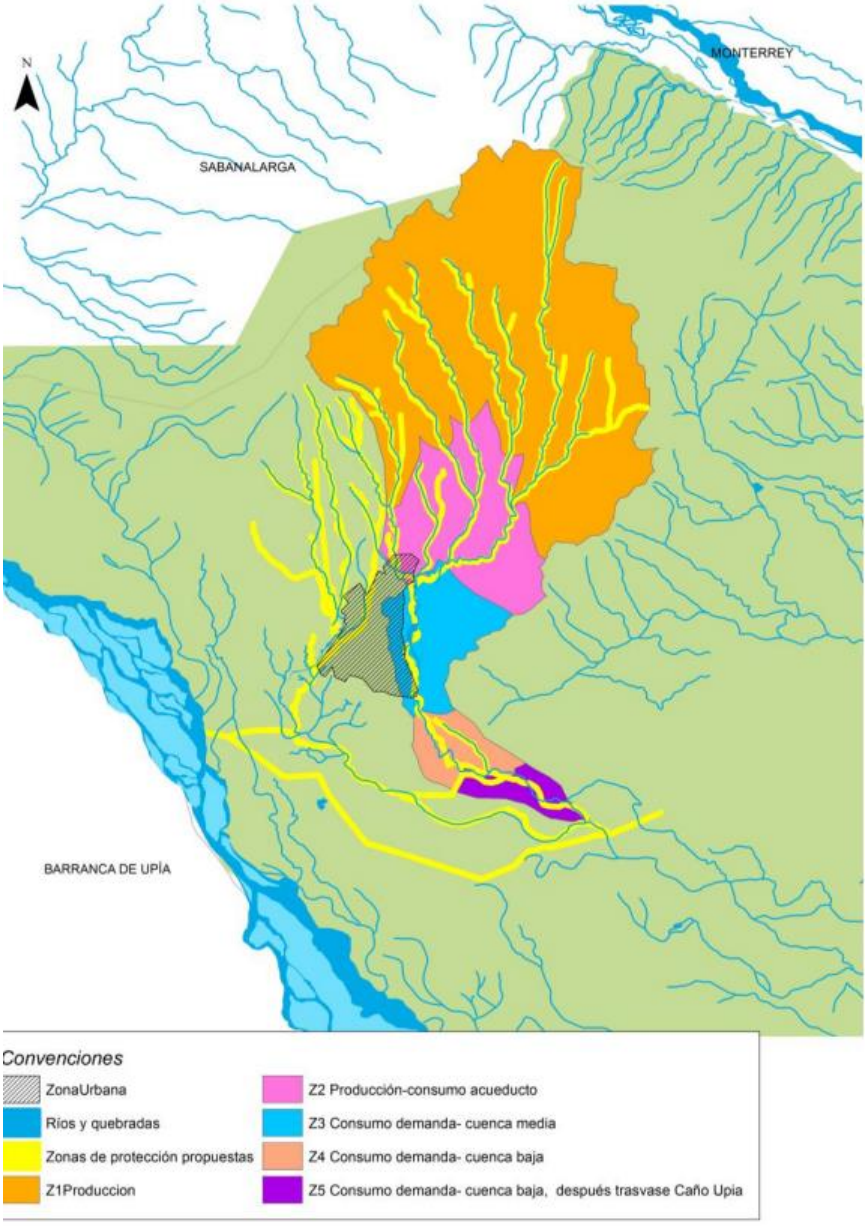
Figure 7 - River and stream reserve areas



Taking into account the PORH of the Agua Clara stream, the project is located in Zone 2 Production-consumption aqueduct. At the same time, within the Villanueva Operational Unit and

its surroundings are the source of the streams that supply the aqueduct of the municipality of Villanueva, so the protective forest area conserved by the Company and the maintenance of the vegetation cover play a fundamental role in the conservation of these, and the species that have their habitat there. These water sources are called Caño Güichiral, Caño Los Mangos, Caño Huerta la Grande, Caño Claro, Caño leche miel, Caño Los micos, which make up the Agua clara stream.

Figure 8 - Water management of the POMCA of the Agua Clara channel



Source: EOT Villanueva, 2010, extracted from Control Ambiental Consulting, 2014.

5 CARACTERISATION OF THE STUDY AREA

The characterisation of the area defined for this study was carried out using secondary information gathered in the recent past by REFOCOSTA and studies in the area where the project is located. A two-day visit was also made to the REFOCOSTA facilities, Villanueva Operational Unit (UOVN), during which a very general and synthetic reconnaissance of the plantation areas, natural areas, operational areas and their associated infrastructure was carried out.

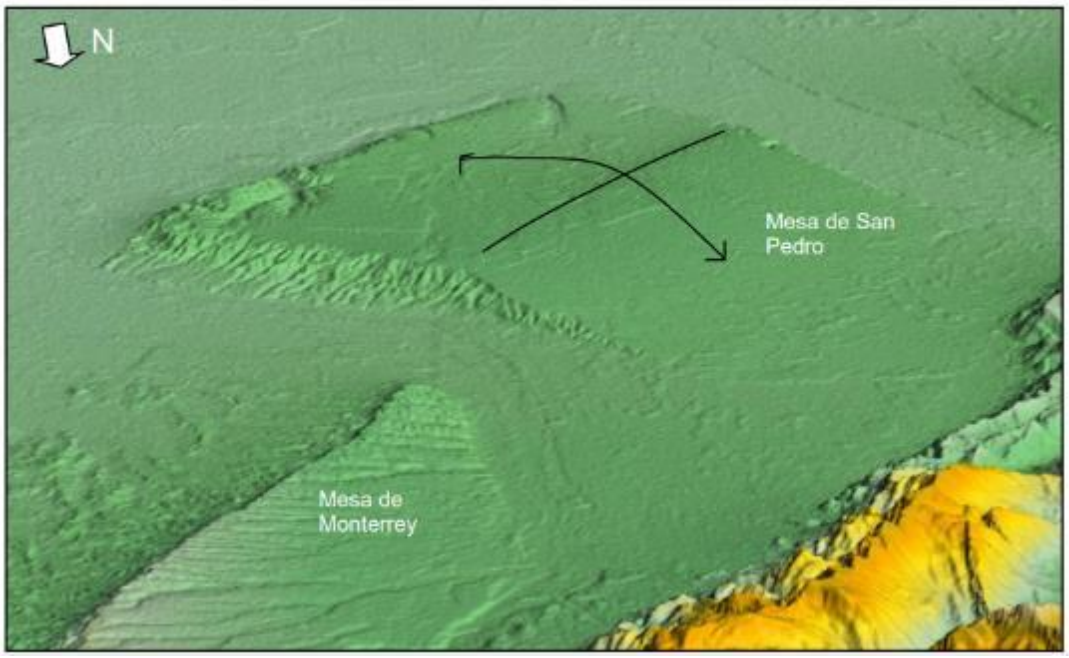
5.1 Physical aspects

5.1.1 Geology

The Villanueva Operational Unit is located in the geological formation known as "Mesa de San Pedro" (Refocosta Forest Management Plan, 2021). The Mesa de San Pedro is an elevated plain overlying conglomerate deposits of the Farallones/La Corneta Formation which in turn overlies the Caja Formation. This mesa has a wide arching that proves that it is the continuation of the Florida Anticline and the arching of the mesa represents the crest of this anticline which also has a gentle dip to the south (INGEOMINAS, 2010) (see Figure 9).

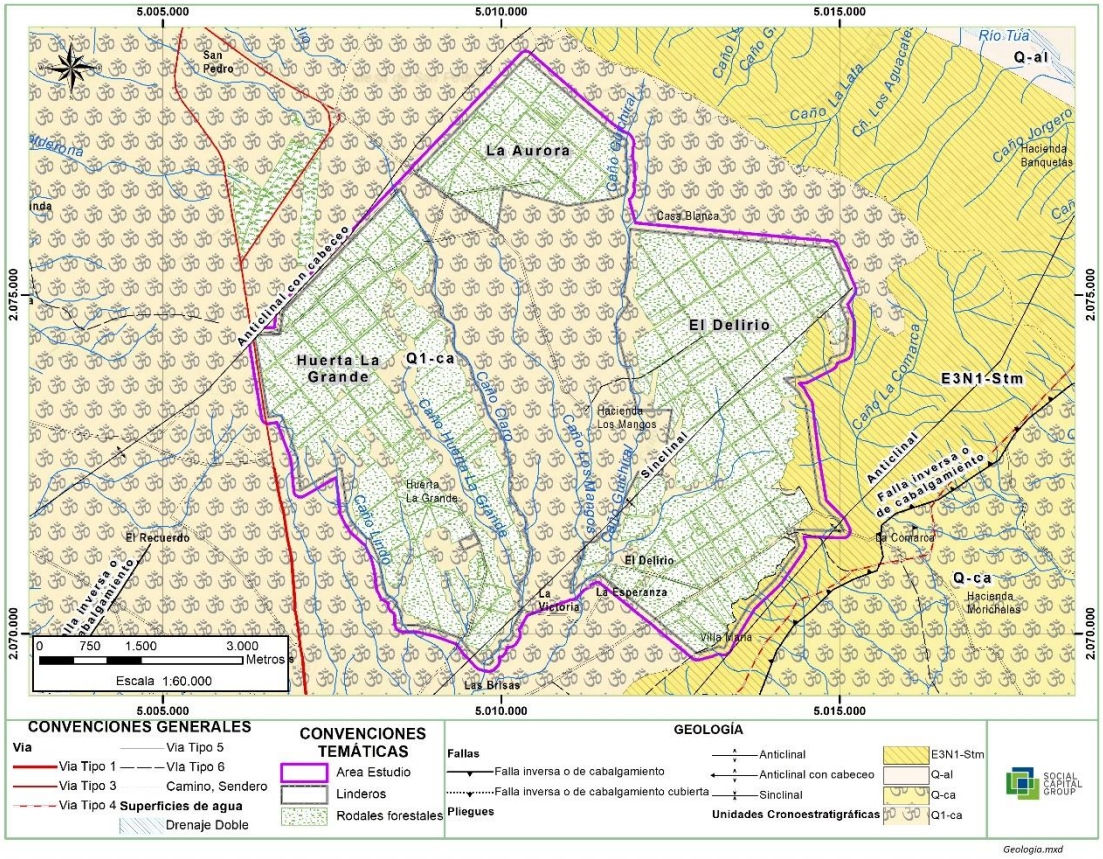
The municipality of Villanueva is located between the Cusiana and Guaicaramo geological faults, and particularly in the area of influence, there is a thrust fault to the southeast and a nodding anticline to the northwest. The specific chronostratigraphic units of the area are Q1-ca, associated with Pleistocene dissected alluvial fans; and, in a reduced area towards the eastern boundary, in the highest zone, unit E3N1-Stm is identified, composed of intercalations of locally conglomeratic sandstones, mudstones and claystones from the Oligocene - Miocene (Figure 910).

Figure 9 - Digital terrain model showing the broad anticlinal arc of the Mesa de San Pedro. View to the south



Source: INGEOMINAS, 2010

Figure 10 - Geology in the area of influence



Source: GEOLOGICAL MAP OF COLOMBIA, SGC, 2015.

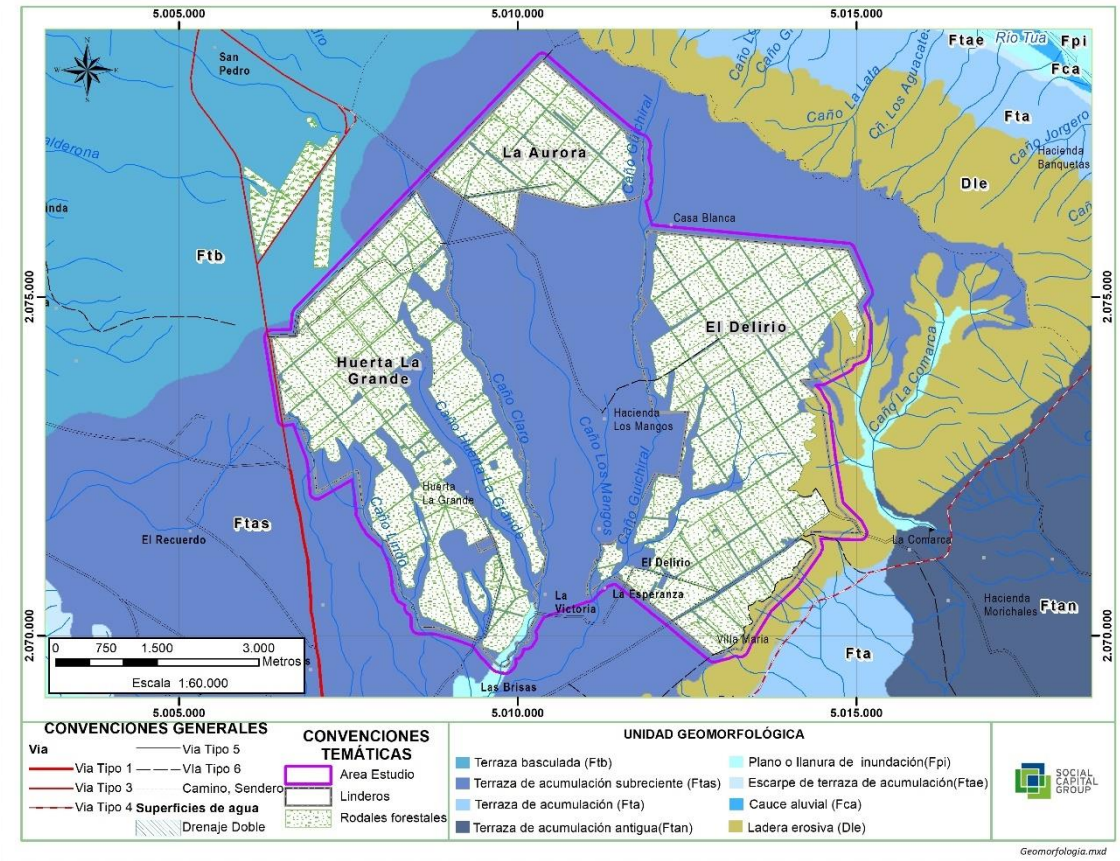
5.1.2 Geomorphology

According to the geomorphology map of the Villanueva EOT (2010), two units converge in the area of influence (Figure 11). In most of the area, the unit Subcretionary accumulation Soil (Ftas) in the flat or level zone (Photo 9); and in the area of steeper slopes, towards the west of the Villanueva Operational Unit, the unit Erosive Slope (Dle) (Photo 8).

Photo 8 - Erosive slope geomorphologic unit, view from Mirador area	Photo 9 - Subcretionary Accumulation Soil
	

Source: SCG, 2021, based on information collected in the field.

Figure 11 - Geomorphology in the area of influence



Source: Geomorphology layer, EOT Villanueva, 2010.

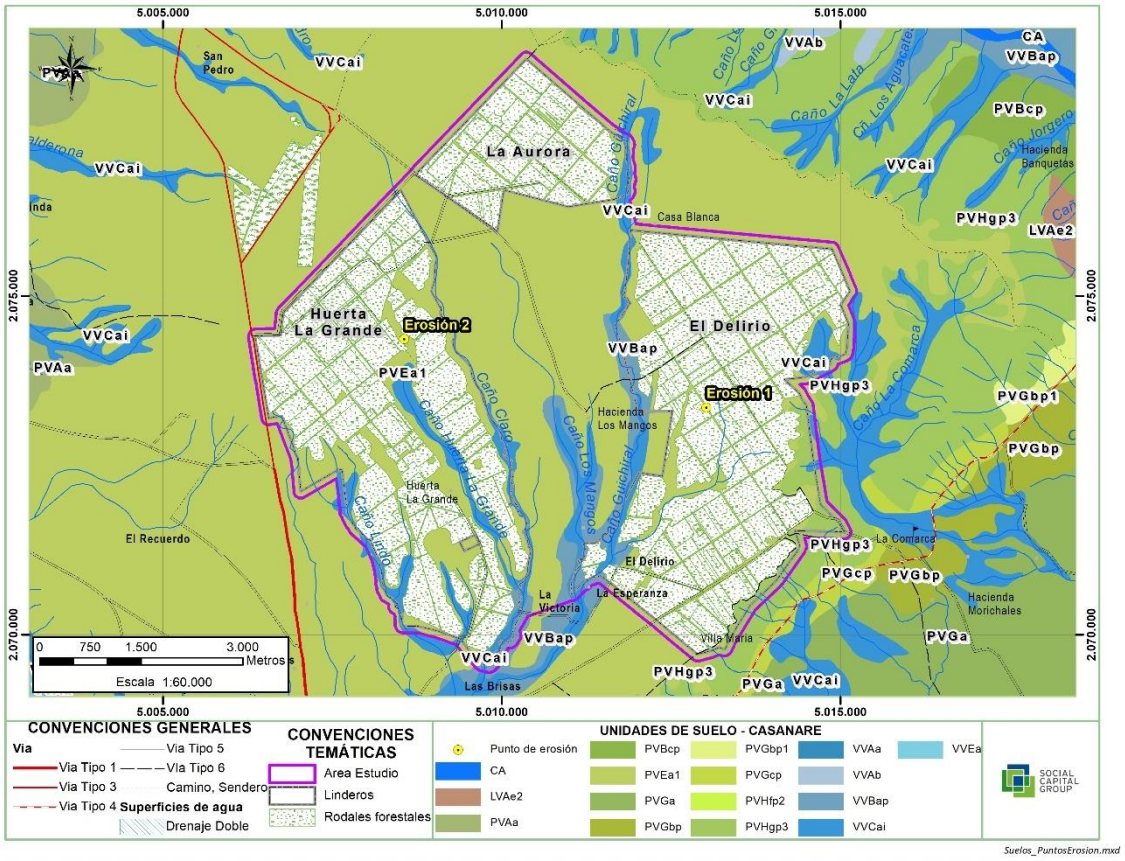
5.1.3 Soils

According to the map and the legend of the general soil survey of the department of Casanare (IGAC, 2014), four soil units are present in the area of influence (Figure 12). On the one hand, the most predominant is PVEa1, related to a terrace-type relief and characterised by being excessively and poorly drained, very shallow, limited by coarse fragments, deep, coarse textures, very strongly acidic, low fertility.

Other important units in the area of influence are those related to the water courses. The first is characterised by being well and poorly drained, moderately deep and very shallow, moderately coarse and fine textures, high aluminium saturation in some sectors, extremely and moderately acidic, moderate and low fertility. The second is better drained, shallow, coarse textured, high aluminium saturation, strongly and very strongly acidic, very low and moderate fertility.

Finally, in the hilly area towards the eastern edge of the area of influence, unit PVHgp3 is found in the escarpment relief, and is characterised by being excessively drained, very shallow, coarse textures, high aluminium saturation, very strongly acidic, very low fertility.

Figure 12 - Soils in the area of influence



With regard to the existence of erosive processes, during the field trip two points were observed in the PVEa1 soil unit, whose characteristic is to be poorly drained in the dry season and to be superficial, increasing the possibility of erosion (Table 3). On the other hand, verification of the soil units in the steep area was carried out, showing that they are in good condition (Photo 10).

Table 3 - Erosive processes evidenced in the field trip

Point	Coordinates		Photo	Description
	N	O		
Erosion point 1	5013021,98	2073353,76		Severe laminar water erosion on the access road.

Point	Coordinates		Photo	Description
	N	O		
Erosion point 2	5008562,33	2074361,09		Anthropogenic erosion generated by severe cutting for the access road.

Source: SCG, 2021, based on information collected in the field.

Additionally, according to the information provided by Refocosta in the 2019 - 2020 Monitoring Report, in the Villanueva Operational Unit, erosive processes have been controlled on the roads between lots 14 and 19 of Huerta La Grande, where laminar erosion was present. As an intervention measure, water energy dissipaters were installed (reduction of water velocity), the road was filled, channelled and profiled (Photo 10).

Photo 10 - Erosion control activities


Source: REFOCOSTA, 2020.

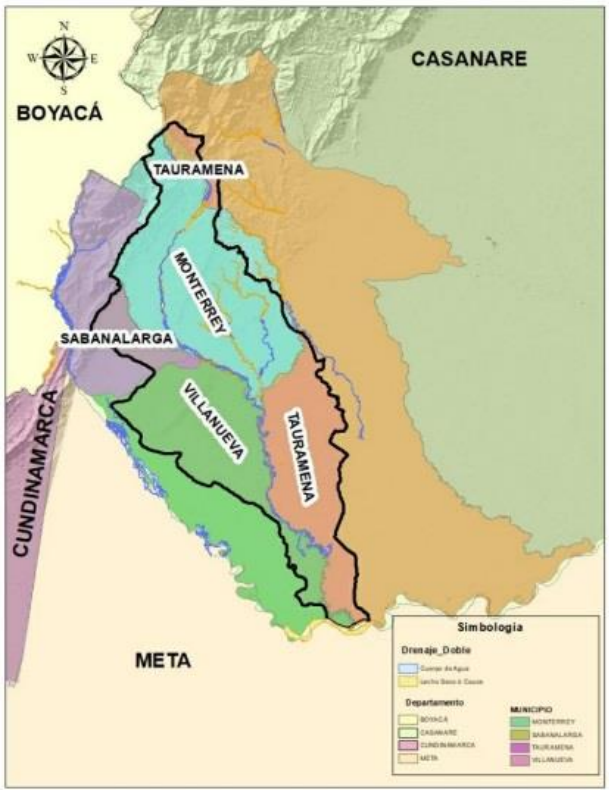
Refocosta has also defined a format for the Evaluation of Areas Susceptible to Erosion (MF-F-01), and during the year 2021 has registered 5 erosion points in the La Aurora estate; 10 in Huerta La Grande; and 17 in El Delirio. Most of these are laminar erosion and erosion by water drops, and to a lesser extent erosion in guardrails and gullies.

5.1.4 Hydrology

The area of influence is part of the Túa river basin (ZSH 351801) whose POMCA was approved and adopted by Resolution No. 300.26.20-407 of 12 April 2020 by Corporinoquia. This basin includes part of the administrative territorial jurisdiction of the municipalities of Monterrey,

Tauramena, Villanueva and Sabanalarga in the jurisdiction of the Corporación Autónoma Regional de la Orinoquia CORPORINOQUIA.

Figure 13 - Municipalities forming part of the Túa river basin



Source: CORPORINOQUIA, 2020.

In the area of influence, there are the following lotic water bodies: Lindo stream, Huerta La Grande stream (in which the Villanueva operating unit has a water concession), Los Mangos stream, Guichiral stream, all of which are tributaries of the Aguas Claras stream. (Photo 11). The micro-basin of the latter has a PORH declared and regulated by Resolution No. 200.41.09.0039 of 16 January 2009 by Corporinoquia. With respect to this body of water, during the field trip we verified its condition, finding that the appearance of the water is crystalline, odourless and colourless, with riparian vegetation. A point of recreational interest of the community was geo-referenced at the exit of the Huerta La Grande property, where the administrative chief stated that Refocosta has implemented some actions to clean the stream due to the fact that the people who visit it leave waste (Photo 11). The coordinates of the point of recreational interest are presented in the Table 4.

It should be clarified that, although part of the Agua Claras micro-watershed is located within Refocosta's properties, this is not the specific case of this site of tourist interest. Refocosta carries out the conservation and protection of native vegetation along the banks of this stream, as well as some cleaning and environmental education activities for the inhabitants of the village who use this place in an unproper manner.

Table 4 - Coordinates of sites of recreational interest in the Agua Clara stream

Point	Coordinates	
	N	O
Site of recreational interest Caño Agua Clara	5011082,60	2070176,47

Source: SCG, 2021, based on information collected in the field.

Photo 11 - Appearance of Caño Agua Clara tourist site

Source: SCG, 2021, based on information collected in the field.

According to the information provided by Refocosta in the 2019 - 2020 Monitoring Report, the lands in the Villanueva Operational Unit are flat, with very good vegetation cover, such as natural forest and forest plantations. Particularly dense cover is maintained along the streams that serve the population of the municipal capital, and work is being done hand in hand with Corporinoquia and the Villanueva Mayor's Office (Public Services Unit) to conserve, regulate and maintain or increase the flow of these streams.

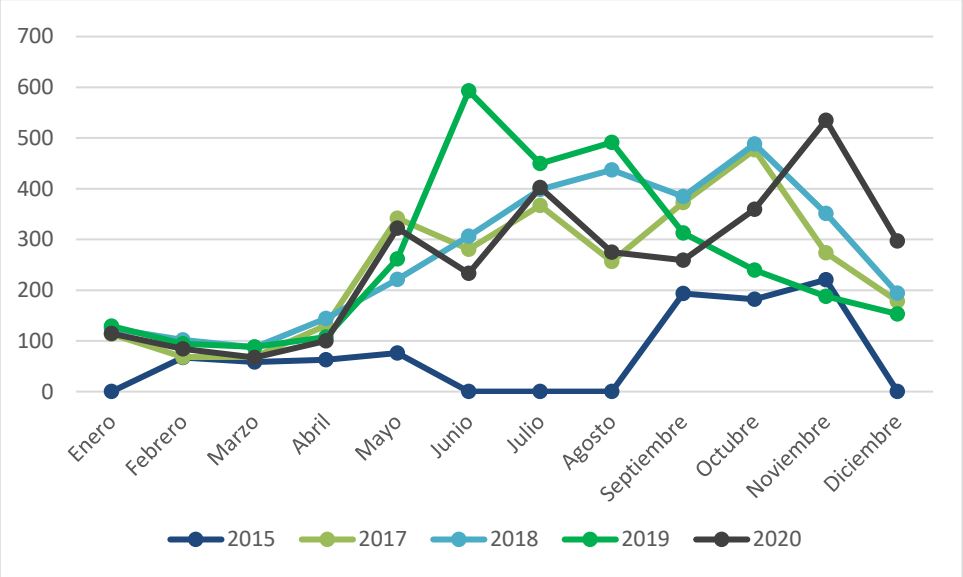
In a section of riparian forest there are two streams from which the Empresa de Servicios Públicos de Villanueva obtains drinking water for a large part of the population. In 1996, the municipality acquired only a part of the land along the banks of these two streams (Huerta La Grande and Caño Claro). The organisation also ceded a portion of its land so that one of the municipal water treatment plants could be installed there.

The Empresa de Servicios Públicos de Villanueva (ESPAVI) provides the Villanueva Operational Unit with information on the physical, chemical and biological analyses carried out at the Caño Claro and Huerta La Grande intakes in order to be aware of the water quality and identify possible effects that could occur due to the organisation's activities and thus prevent and/or control them. The main parameters monitored against the maximum permissible limits are: Nitrates, Oxygen Content, Coliform Content, pH.

These parameters are within the reference values, which indicates that the good characteristics of the resource present in Caño Claro and Huerta La Grande are maintained, making the water suitable for treatment and consumption by the community of Villanueva.

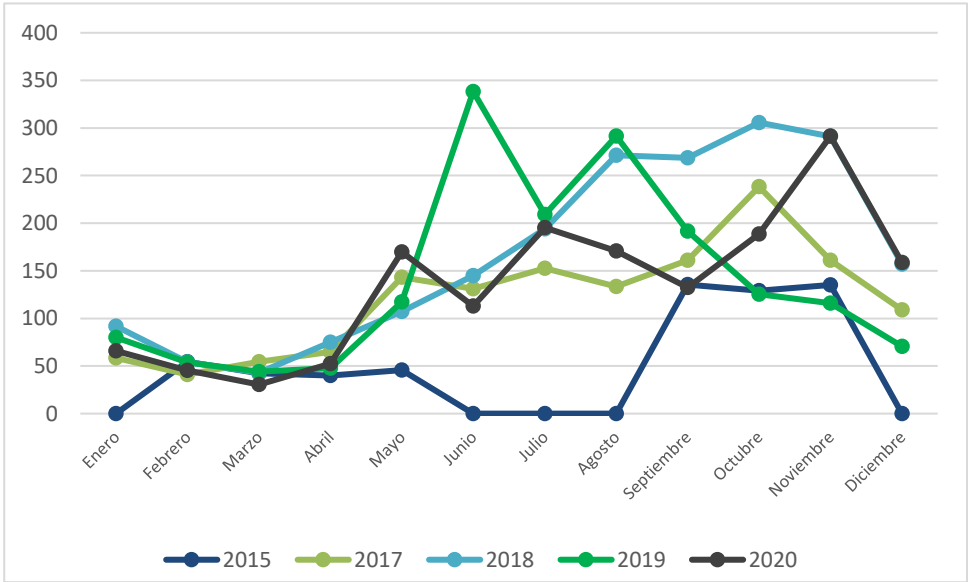
Finally, with respect to the flow data (l/s) provided by Refocosta's 2019 - 2020 Monitoring Report, the following data are generated (Error! Reference source not found. and Graph 2) for monthly multi-annual flows. There it can be seen that both streams show lower flows in the dry season between December and April, and an increase between the months of May and November.

Graph 1- Historical flows Caño Agua Clara (l/s)



Source: SCG, 2021, based on information from Refocosta, 2020.

Graph 2 - Historical flows Caño Huerta La Grande (l/s)



Source: SCG, 2021, based on information from Refocosta, 2020.

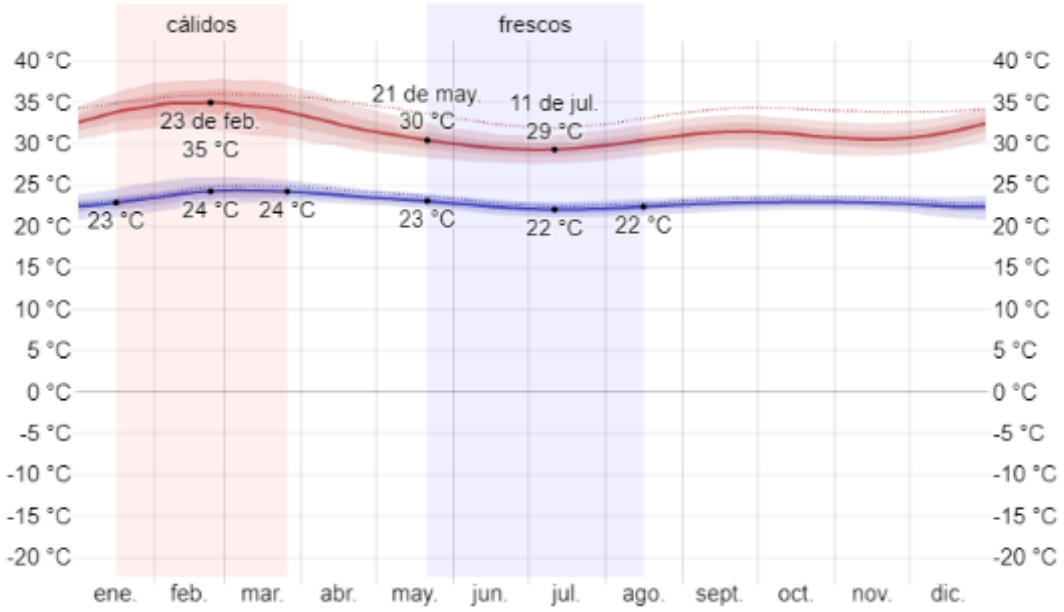
5.1.5 Climate

According to data from the IDEAM weather station in the Huerta La Grande area. The municipality of Villanueva has an average temperature of 25.7 °C, with the hottest months being January to

March, when the average daily maximum temperature can reach 34°C (Graph 3). Regarding precipitation, Villanueva has an extreme variation of monthly rainfall per season. It rains all year round. The month with the most rainfall is May, with an average of 192 millimetres of rain. The month with the least rainfall is January, with an average of 21 millimetres of rainfall (Graph 4).

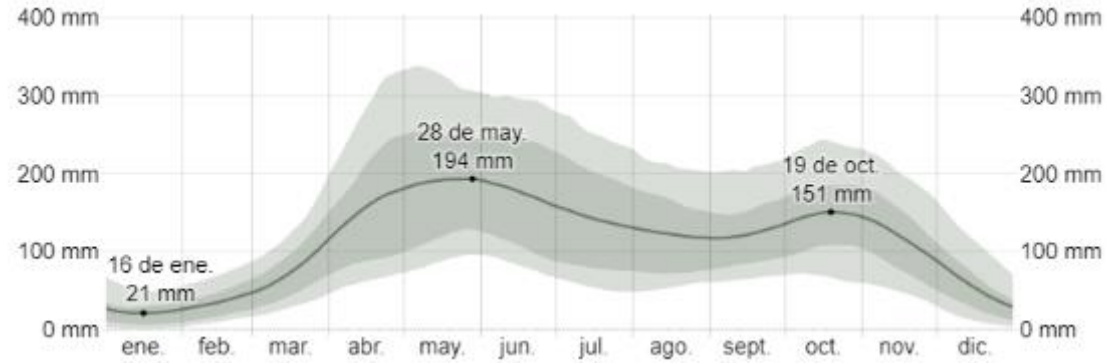
According to the Caldas Lang classification made by the IDEAM in its climate classification, the area of influence corresponds to a warm humid climate.

Graph 3 - Average maximum and minimum temperature in Villanueva



Source: © WeatherSpark.com

Graph 4 - Average monthly rainfall in Villanueva



Source: © WeatherSpark.com

5.1.6 Solid waste management

According to Refocosta's 2020 Sustainability Report, the main objective of promoting waste management was to improve separation at source and thus prevent waste that can be used from ending up in landfills. This is evidenced by the 39% increase in the volume of non-hazardous waste collected, from 5,280 kg in 2019 to 9,510 kg in 2020.

Non-hazardous waste represents the largest percentage of the waste generated by the Villanueva Operational Unit and is disposed of in landfills, while hazardous waste is disposed of through authorised waste managers (Albedo S.A.S and Descont) by incineration. According to information provided during the field visit, during the year 2021, 13,127 kg of hazardous waste, 4,917 kg of usable waste and 2,509 kg of non-usable waste were generated.

With regard to harvesting, it is important to highlight Refocosta's approach to the utilisation of by-products through the marketing of firewood, charcoal, pulp, substrate and sawdust from plantations and industrial operations. According to the 2019-2020 Monitoring Report, the marketing of firewood and charcoal increased during 2020 thanks to the positioning of the brand in department stores.

Finally, the by-products related to the biomass resulting from pruning and thinning activities are not considered as waste, nor are they managed as such, as they are directly incorporated into the soil in the plantation.

Table 5 - Quantities of by-products marketed

By-product/year	2019	2020
Units of firewood packages invoiced	10.463	15.203
kg of coal invoiced	44.840	57.230
m3 pulp invoiced	2.177	1.265
m3 substrate invoiced	432	274
m3 sawdust invoiced	14.673	12.567

Source: SCG, 2021; based on Refocosta 2020 data.

5.2 Biotic aspects

5.2.1 Biomes and ecosystems

5.2.1.1 Biomes

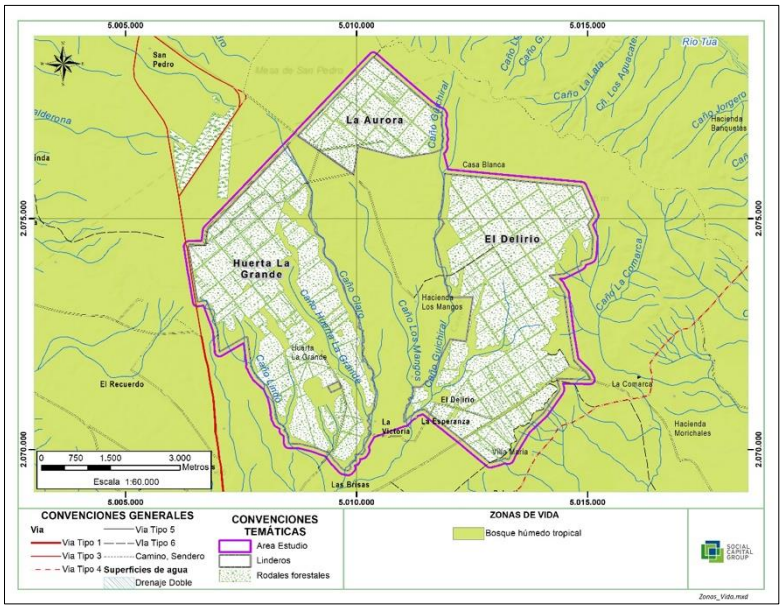
According to the IDEAM, IGAC, IAvH, INVEMAR, I. SINCHI and IIAP, (2007), the area in which the Villanueva Operational Unit (UOVN) is located is within the Great tropical rainforest biome, and within the Amazon-Orinoquia tropical humid Zonobioma biome.

This biome is predominantly characterised by two types of climate: warm very humid (60%) and warm humid (40%). It is mainly found on two geomorphological units: Erosional fluviogravitational and structural fluvio-gravitational upland (86%) and alluvial plains (13%), covered by natural forests (92%), pastures (6%) and grasslands (2%). The predominant land covers are: Natural forests and Pastures (IDEAM, IGAC, IAvH, INVEMAR, I. SINCHI and IIAP, 2007).

5.2.1.1.1 Life zones

The area in which the Villanueva Operational Unit (UOVN) of Reforestadora de la Costa S.A.S. is located, according to the Ecological Map generated by the Instituto Geográfico Agustín Codazzi - IGAC (Espinal, S., 1977), corresponds to the tropical rainforest life zone (bh - T), which according to the bioclimatic approach proposed by Holdridge (1979), defines homogeneous units, based on annual precipitation, water availability, air temperature, soil and evapotranspiration (Espinal & Montenegro, 1963). This proposal refers to the plant formation (ecosystem) that can develop in a given area and does not necessarily correspond to the type of cover that is currently present (Figure 14).

Figure 14 - Living zone area of influence Villanueva Operational Unit



5.2.1.1.1.1 Tropical rain forest (bh- t)

The tropical humid forest life zone (bh - T) is determined by the altitudinal range between 0 and 1,000 m. a.s.l.; with precipitation ranging between 2,000 and 4,000 mm of annual rainfall and bio-temperatures above 24°C. The Villanueva Operational Unit (UOVN), of Reforestadora de la Costa S.A.S., is characterised by belonging to the "humid" humidity province and because the area is located between 175 and 200 m.a.s.l. in the tropical thermal floor.

It is an area in which the presence of differentiated vegetation cover is particularly evident according to their biotic importance; this is how the gallery forests are classified in natural areas of very high environmental sensitivity because they are located on the banks of the canals and have exceptional characteristics such as being able to group several endemic species of fauna; In addition to a great floristic, physiognomic and successional diversity, despite being vulnerable to anthropic activity, they have a high level of recovery from forest fires; but in general they are areas that in their majority have been conserved, complying with the typical cycles of these ecosystems.

1.2.1.3 Biogeographical province

The area in which the Villanueva Operational Unit (UOVN) of Reforestadora de la Costa S.A.S. is located, according to Hernández-Camacho *et al*, (1991) is classified as the Orinoco Province, which includes the highly transformed Piedemonte Meta district and the Casanare district, with medium transformation. The province is located in the east of the country covering the Meta River, towards the Arauca, according to the National University (2009).

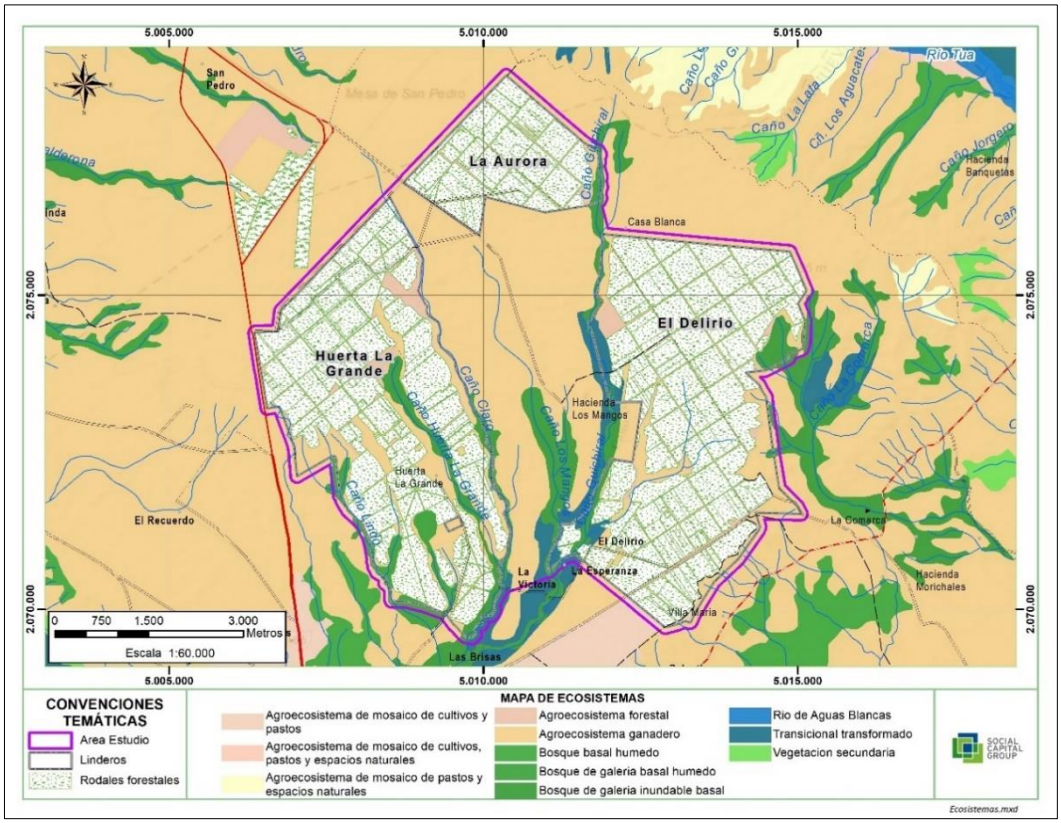
1.2.1.4 Ecosystems

Ecosystems are defined as a dynamic complex of plant and animal communities that interact as a functional unit materialised in a territory, which presents a homogeneity of geopedological and climatic characteristics and conditions influenced by anthropic activities as reflected by land covers (IDEAM, IGAC, IAvH, INVEMAR, I. SINCHI and IIAP, 2007).

According to the map of continental, coastal and marine ecosystems for Colombia, in the area where the Villanueva Operational Unit (UOVN) of Reforestadora de la Costa S.A.S. is located, the following ecosystems are mainly registered (Figure 15):

- Transitional transformed.
- Livestock agro-ecosystem.
- Humid basal gallery forest.

Figure 15- Ecosystems present in the area of influence Villanueva Operational Unit

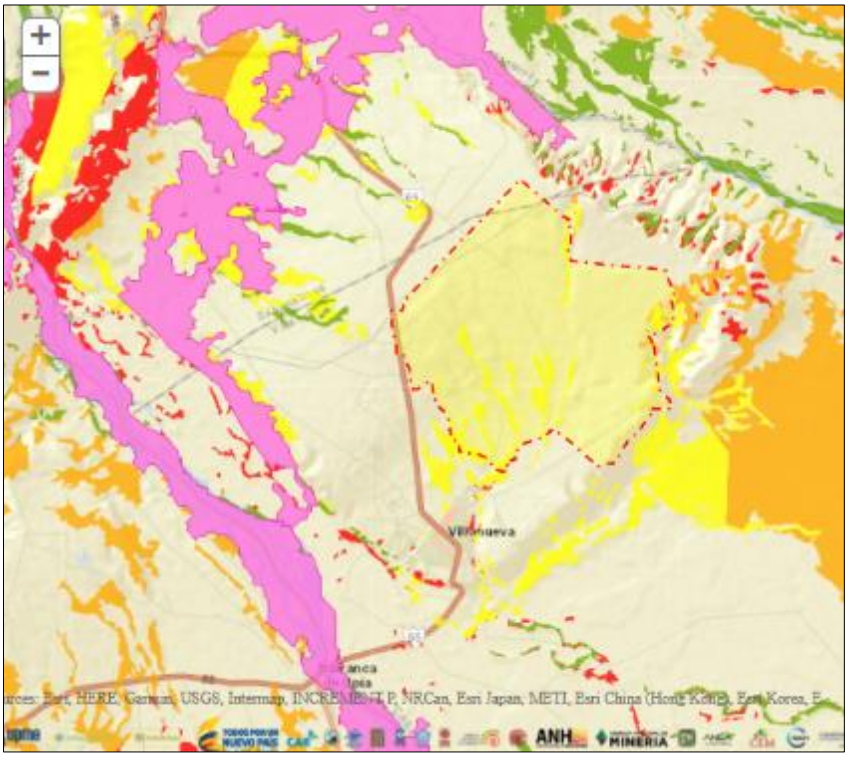


Source: IDEAM, *et al*. 2007, adapted by SCG, 2021.

5.2.2 Strategic ecosystems and sensitive areas

For the Villanueva Operational Unit (UOVN) project, it was verified that its area of operation was not located in areas of sensitive ecosystems, as well as natural ones. For this purpose a consultation was carried out through the Tremarctos - Colombia Module version 3.0 (Rodríguez-Mahecha, J. V., et al. 2015), a module that contains information on geographic areas of biotic and socio-cultural importance, in addition to a preliminary assessment of the vulnerability of the environment generated by infrastructure and mining works. It was determined that this area has a low impact (Figure 16), therefore it is considered that the Villanueva Operational Unit (UOVN) is in a suitable location for its operation.

Figure 16 - Report Tremarctos 3.0 area of influence Villanueva Operating Unit



Section

Affectation	Section	Weighting	Compensation Area	
LOW AFFECTATION	Section 1-1	0	15957.8449 Ha	

Source: Tremarctos Module - Colombia version 3.0 (Rodríguez-Mahecha, J. V., *et al*. 2015), accessed by SCG, 2021.

5.2.3 Description of the flora of the area

Vegetation cover is defined as the integral expression of the interaction between biotic and abiotic factors in a given space. It is associated with natural species, but it is necessary to include those that are of cultural origin or are derived from human activities such as plantations, crops or landscape arrangements that, although not natural, fulfil an ecological function (Van Wijngarrden, 1994, p. 24, cited by Cortes & Rubio, 2016).

For the identification of land cover in the study area, the "Leyenda Nacional de Coberturas de la Tierra, Metodología Corine Land Cover 2010" adapted for Colombia (IDEAM, 2010) was used; secondary information from official sources as well as that provided by Refocosta was reviewed and complemented with primary information captured during field visits, resulting in the land cover map shown in the figure 17.

Four groups of coverages were identified for the study area, which correspond to artificial territories, which mainly correspond to the road network; agricultural territories, among which clean pastures predominate; forests and semi-natural areas, among which both gallery forest and high secondary vegetation stand out; and finally, river cover, which includes the streams that run north-south in the plantation area. In the Table 6 the identified land covers are shown.

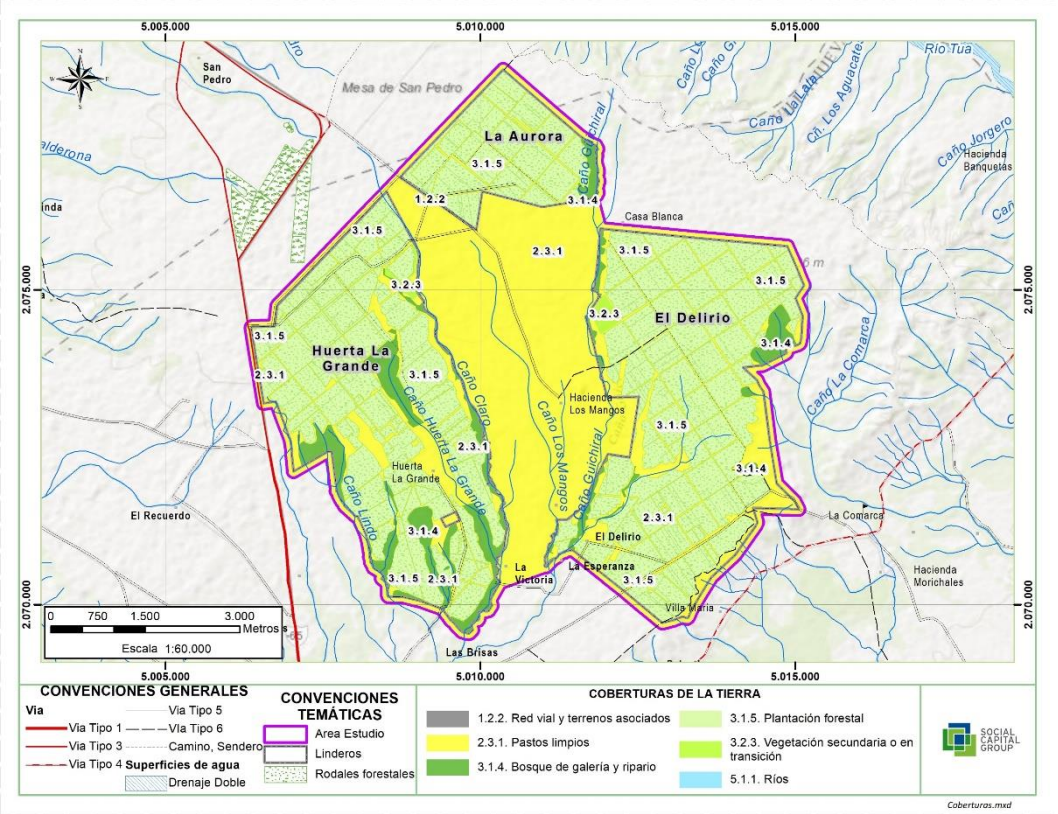
Table 6 - Land cover in the project area

CORINE LAND COVER METHODOLOGY			DESCRIPTION	SYMBOL
LEVEL 1	LEVEL 2	LEVEL 3		
1. ARTIFICIALISED TERRITORIES	1.2. Industrial or commercial areas and communication networks	1.2.2. Road network and associated land	Roads associated with housing units, urban infrastructure, or to plantation lots.	Rv
2. AGRICULTURAL TERRITORIES	2.3. Grassland	2.3.1. Clean pastures	This cover includes land occupied by clean pasture with a percentage of cover greater than 70%. The management practices (clearing, liming and/or fertilisation, etc.) and the level of technology used prevent the presence or development of other covers. This cover is present in the region due to livestock farming, most probably several extensions of natural savannahs have been replaced by clean grasses.	Pl
3.FORESTS AND SEMI-NATURAL AREAS	3.1. Forests	3.1.4. Gallery and riparian woodland	This refers to tree vegetation cover along the banks of permanent or temporary watercourses. This type of cover is limited in its extent, as it borders watercourses and natural drainages. When the presence of these forest strips occurs in savannah regions it is known as gallery forest. This unit is present in the most relevant drainages within the project area, such as the Upía river. The most relevant forest species in the gallery forests are: Majagüillo (*Xylopia sp.*), Carutillo (*Chimarrhis microcarpa)*, Tachuelo (*Zanthoxylum rhoifolium*), Cresta de gallo (*Warszewiczea sp.*), Yarumo (*Cecropia sp.*), Nocuito (*Tabebuia barbata*), Cedrillo (*Trichillia schomburgkii*), Chingalé (*Jacaranda copaia*), Nacedero (*Trichanthera gigantea*), Saladillo (*Voshysia lehmannii*), Cucharo (*Myrsine latifolia*), Palma cumare (*Astrocaryum chambira*) and Tuno (*Miconia sp*), Anón (*Annona sp.*), Nispero (*Bellucia pentanera*), Guacharaco (*Cupania cinerea*), Varasanta (*Triplaris americana*) and Palma moriche (*Mauritia flexuosa*), among others. They regulate flows, control erosion and favour the deposit of alluvial material, enriching the soil by retaining the nutrients that are transported by the current. They also act as dispersal corridors, as well as refuge, habitat and nesting sites for regional wildlife.	Bg
		3.1.5 Forest plantation	Cover consisting of plantations of tree vegetation, mainly made up of various species of Pine (*Pinus Caribaeae*) and Eucalyptus (*Eucalyptus pellita* F. Muell), for the purpose of forest management for timber production. In the area these plantations are structured in forest stands that form a regular geometric pattern.	Pf

CORINE LAND COVER METHODOLOGY			DESCRIPTION	SYMBOL
LEVEL 1	LEVEL 2	LEVEL 3		
	3.2. Areas with herbaceous and/or shrub vegetation	*3.2.3. Secondary or transition vegetation*	It includes that vegetation cover originated by the process of succession of natural vegetation that occurs after the intervention or destruction of primary vegetation, which can be found in recovery tending to the original state. It develops in areas cleared for different uses, in abandoned agricultural areas and in areas where the natural vegetation was destroyed by natural events. There are no elements intentionally introduced by man. Remnants of this type of vegetation are found in areas that have been earmarked for recovery within plantations.	Vst
5. WATER SURFACES	Inland waters	*5.1.1. Rivers*	A river is a natural watercourse that flows continuously, has a considerable flow and flows into the sea, a lake or another river. The minimum mapping unit is considered to be those rivers with a channel width greater than or equal to 50 metres. The most important river near the project is the Upía river.	R

Source: IDEAM. 2010), adapted from SCG, 2021.

Figure 17 - Land cover map



The following is a description of the land cover identified according to the Corine Land Cover methodology for Colombia (2010), implemented by the Institute of Environmental Studies of Colombia - IDEAM.

5.2.3.1 Pasture areas

According to IDEAM (2010), this coverage corresponds to those areas destined for the development of mainly livestock activities, dedicated to the breeding of bovine animals, and therefore includes areas where permanent crops have been established, corresponding to grass species.

In general, for the study area, this cover includes lands occupied by clean pastures of different species optimised for livestock activity, with a percentage of cover greater than 95%; which have evidence of management practices (cleaning, liming and/or fertilisation) which prevents the presence or development of other covers. It is important to point out that the origin of these areas of grasses is not due to deforestation processes, but rather that they have displaced other species of grasses that are common in the natural savannahs of the Orinoquia. In general, it is possible to observe in the area grasses such as guaratara (*Axonopus purpussi*), white grass (*Panicum versicolor*), crowngrass (*Paspalum notatum*, *Paspalum conjugatum*), black grass (*Hymenachne amplexicaulis*) and ashy grass (*Axonopus sp.*) and to a lesser extent grasses such as cow's tail (*Andropogon bicornis*), more typical of the savannahs further east.

In general, the areas of grassland in the study area are associated with specific locations such as the areas surrounding the camp, and other areas that correspond to transitions between the plantation zones and natural areas (Photo 12-16). Due to constant use, these areas in general do

not show abundant natural regeneration, however, in those areas where the presence of nearby forest areas is favoured, there is abundant natural regeneration, which favours the expansion of tree areas.

Photo 12 - Grassland cover in the project area

Photo 13- areas of cleared grassland in areas adjacent to the planted forest.

Photo 14- transition zones between forest and plantation with presence of grasses.

Source: SCG, 2021

Photo 15- Extensive areas of clean pasture in the outer area between the farms.

Photo 16- Areas of naturally regenerating grassland of the genus Miconia, fam. Melastomataceae.

Source: SCG, 2021

5.2.3.2 Gallery forest areas

This type of cover corresponds to areas with arboreal vegetation characterised by a predominantly continuous and linear stratum of tree cover representing more than 85% cover and with a canopy height of between 6 and 14 meters, with emergent individuals that can reach up to 22 metres in height. This is located on the fringes adjacent to the main lotic water bodies, which have soil and humidity conditions conducive to the development of this type of vegetation and also have periodic flooding conditions. In the study area, this type of forest is present in elongated and continuous cover of varying extent, associated with the main streams, mainly in the Huerta La Grande and El Delirio estates.

The most representative flora species include: Yarumo (*Crecropia engleriana*), Palma corozo (*Acrocomia aculeata*), Hobo (*Spondias mombin*), Punta de lanza (*Vismia baccifera*), Trompillo (*Guarea guidonia*), Cañofistol (*Cassia moschata*), Saladillo (*Vochysia lehmannii*), Guarupayo (*Tapirira guianensis*), Algodoncillo (*Alchornea triplinervia*), Bototo (*Cochlospermum vitifolium* (Willd.) Spreng), Carob (*Hymenaea courbaril* L), Carutillo (*Isertia haenkeana* DC). Moriche palm (*Mauritia flexuosa* L.f.), Myrtle (*Myrcia splendens* (Sw. DC), Toasted corn (*Phyllanthus* sp.), Monkey grass (*Tabernaemontana* sp) and Prickly pear (*Miconia rubiginosa* (Bonpl.)).

In general, it is important to mention that these areas of forest are associated with the banks of the streams, forming strips of different lengths and different successional status, which shows that they are in the process of expansion, as in some specific places you can see inside the forest the old fences that divided the forest strips and were previously on the edges (photo 18-21). In this way, the forest strips vary in length, being denser and in a better state of conservation in the northern sector (above the camp) than towards the southern sector.

In terms of floristic composition, in some sites with higher moisture content there is a high presence of palms, the most relevant being moriche palms, although in other sectors there is a predominance of royal palm (*Attalea* sp) and stilt palm (*Syagrus* sp) associations.

The forest has been gaining space, as evidenced by the old fences in the middle of the vegetation.

Photo 17- Panoramic view of gallery forest in the northern part of the camp area.	Photo 18- General view of forest areas in the southern part of the camp.
	

Source: CSG, 2021

Photo 19 - detail of the remains of fencing structures inside the gallery forest.	Photo 20 - Presence of palms of the genus *Syagrus,* inside the gallery forest.
	

Photo 21- Panoramic view of gallery forest areas, with dominant presence of moriche palm (*Mauritia flexuosa*) towards the southern part of the Huerta La Grande estate.

Source: CSG, 2021

As for the natural regeneration processes, it is important to mention that these are being carried out in an adequate manner, with an abundant quantity of seedlings in the sapling and grassland stages of species that are valuable for the ecosystem and which have a more sciophyte (shade-loving) habit. In other sites, with a greater presence of light, palm regeneration is also abundant, becoming the dominant species in these places (Photo 22-23).

Photo 22- Detail of the abundance of natural regeneration within the gallery forest.

Photo 23- Detail of palm regeneration (fam. *Arecaceae*) towards the northern sector of the project.

Source: CSG, 2021

Finally, it is important to note that these areas show no evidence of recent anthropic intervention as logging, felling or use of secondary forest products by neighbouring communities, which shows the good state of conservation and maintenance of the forest cover by the company.

5.2.3.3 Forest plantation areas

These are tree plantations made up of tree vegetation, carried out by direct human intervention for the purpose of forest management (IDEAM, 2010). In the study area, forest plantations are distributed over approximately 1773 ha, corresponding mainly to two species. Caribbean Pine (*Pinus Caribaeae*), and Eucalyptus (*Eucalyptus pellita*).

Due to the characteristics of the current operation, these species are distributed in different stands, located in each of the properties that make up the project (Huerta la Grande, El Delirio and La Aurora), which have different degrees of growth, from recently planted to mature stands ready for harvesting.

In general and as expected in this type of cultivation, understorey biodiversity at the flora level is low, although it is possible to find some species of both herbaceous and shrub habit, isolated within the stands (Photo 24-25).

Photo 24 -Interior view of adult pine (*Pinus caribaeae*) plantations.

Photo 25 - Panoramic view of pine stands, separated by firebreak areas on the El Delirio estate.

Source: CSG, 2021

5.2.3.4 Areas of tall secondary vegetation

According to IDEAM (2010), this type of cover consists of areas covered by mainly arboreal vegetation with irregular canopy and occasional presence of shrubs, palms and creepers, which corresponds to the intermediate stages of plant succession, after a process of abandonment or afforestation of pastures. It develops after productive activities have ceased. Depending on the time elapsed, tree communities formed by a single species or by a small community of heliophilous pioneer species can be found.

In the study area, the high secondary vegetation is concentrated specifically in areas where there were previously forestry plantations but which were then left to rest, without any type of management, allowing the process of natural regeneration with native species other than pine and eucalyptus, which at the moment is being carried out successfully. These zones are mainly found in the El Delirio farm, towards the northern sector, where it is possible to find patches formed by communities of typical heliophilous native species such as Bototo (*Cochlospermum vitifolium*), Lacre (*Vismia macrophylla*), which predominate especially on the edges, accompanied by other species such as Yarumo (*Crecropia engleriana*), Trompillo (*Guarea guidonia*), Maiz tostao (*Phyllanthus* sp.) and tuno (*Miconia rubiginosa* (Bonpl.).

In general, these areas show an adequate development, given that they are in transition towards more consolidated forest areas, which is evident in the regeneration processes where individuals of ecologically valuable species such as laurel (*Ocotea* sp), Trompillo (Guarea guidonia), Cañofistol (Cassia moschata), Saladillo (Vochysia lehmannii), Guarupayo (Tapirira guianensis) and Guarupayo (Tapirira guianensis) can be found in their saplings, Trompillo (*Guarea guidonia*), Cañofistol (*Cassia moschata*), Saladillo (*Vochysia lehmannii*), Guarupayo (*Tapirira guianensis*) and Algarrobo (*Hymenaea courbaril* L). (Photo 26-27).

Photo 26- General view of the areas of tall secondary vegetation intended for protection to the north of the El Delirio property.

Photo 27 - Detail inside the secondary vegetation areas, where the abundance of light is evident.

Source: CSG, 2021

5.2.3.5 Rivers

These are permanent, intermittent and seasonal water bodies and watercourses located in the interior of the continent (IDEAM, 2010). Four water bodies were identified in the study area, three of which are associated with the Huerta la Grande property, and one of which is associated with the El Delirio property. In general, these consist of canals and streams with continuous flowing water, and have a channel width of between 3 and 8 metres approximately (Photo 28-29).

It is important to mention that one of these rivers supplies the aqueduct of the urban centre of the municipality of Villanueva, which is why its intake is located inside the project.

Photo 28- Partial view of the stream at the Huerta La Grande estate.

Photo 29- Partial view of the stream in areas near the camp.

Source: CSG, 2021

5.2.4 Description of the fauna of the study area

The Villanueva Operational Unit (UOVN) of Reforestadora de la Costa S.A.S. is immersed in the great unit of the Orinoco. The greatest floristic and habitat diversity is concentrated in forested areas such as gallery forests (Ojasti 1990; Rangel et al. 1995; Stotz et al. 1996, Pefaur and Rivero 2000, cited in WWF 2001).

Wildlife shows a gradient in its diversity, in which the number of species increases from the plains, to the forests of the Macarena - Guaviare and the Andean foothills that include the departments of Meta, Arauca and Casanare (the latter is the area that is the subject of this study).

Due to its hydrography, the Orinoquia is the area of the country with the second highest fish richness, with 46% of the country's fish species (Maldonado-Ocampo et al., in Romero et al. 2009). It also has 40% of the national bird species, as well as a good representation of amphibians, reptiles and mammals in terms of species, with some cases of endemism (Lasso et al. 2010).

5.2.4.1 Terrestrial vertebrate fauna of the study area

5.2.4.1.1 Method of data collection

For the knowledge of the faunal groups of the groups of: Amphibians, reptiles, birds and mammals, we turned to existing information on wildlife recorded in monitoring in the Villanueva Operational Unit (UOV) in 2012 and 2020, carried out by Reforestadora de la Costa S.A.S. Likewise, other studies of areas close to and biotically coinciding with the characteristics of the Villanueva Operational Unit (UOVN) were consulted, taking into account that it belongs to the great region of the Colombian Orinoquia, its relative proximity to the foothills of the eastern mountain range, eastern slope and the savannahs of the municipalities of Villanueva in the department of Casanare and Barranca de Upía in the department of Meta. All this information was reviewed and adjusted, their distributions were compared and it was verified whether they were in any of the categories of threat, or if they were endemic or had restricted distributions.

We also consulted scientific publications by several authors who report on the composition and structure of terrestrial vertebrate species: Emmons 1997; Uribe 1994; Hilty and Brown 1986, among others.

In addition, the lists of species with threat categories were consulted; Resolution 1912 of 2017 published by the Ministry of Environment and Sustainable Development, which endorses the IUCN global extinction criteria for our country.

5.2.4.1.2 Wildlife

Herpetofauna

Potential amphibians in project area

As potential amphibian species reported directly from sampling in the area, nine species belonging to five families are known, all of the natural order (Table 7).

Table 7- Amphibians potentially present in the Villanueva Operational Unit area

Order	Family	Species	Common Name
Anura	Bufonidae	*Rhinella marina*	Toad
	Hylidae	*Scinax ruber*	Frog
		Boana crepitans	Frog
	Phyllomedusidae	*Pithecopus hypochondrialis*	Frog
	Leiuperidae	*Pseudopaludicola boliviana*	Frog
	Leptodactylidae	*Leptodactylus colombiensis*	Frog
		Leptodactylus fuscus	Frog
		Lithodytes lineatus	Frog
		Leptodactylus insularum	Frog

Source: Various authors compilation SCG, 2021.

All amphibians belong to the insectivorous guild, which is characterised by the fact that species consume arthropods (insects, arachnids, crustaceans). In general the anuran group is

opportunistic, feeding on any small animal that can be caught and swallowed, most amphibians are small in size (Forstener *et al*. 1998; Zug 1993). Amphibians' choice of prey reflects their habitat and ability, although some have developed preferences for a particular prey resource (Forstner *et al*. 1998).

Two major dietary patterns have been identified for tropical anurans; "ant specialists", who consume chitinous, slow-moving arthropods such as ants and termites, and "non-ants specialists", who consume large, less chitinous and more mobile prey such as orthoptera and spiders (Toft 1980 - 1981).

These dietary specialisations are intrinsically linked to the foraging strategies they apply, such as: perching and waiting, active foraging, nocturnal or diurnal activity, natural defence mechanisms, type of habitat they occupy and seasonal variability in the abundance of the resource (Santos et al. 2004). The ecological role that amphibians play in the different vegetation covers was observed to be insects population controllers.

The amphibian species potentially recorded for the study area are associated with forests and water bodies, with the exception of *Rhinella marina*, which usually occupies other areas, including dwellings. Amphibians are restricted to humid environments, so it is to be expected that they are more likely to be found in forests than in open areas, basically because there is a thick layer of leaf litter on the ground and temperatures are lower and more stable (Photos 30-31).

Photo 30 -Leptodactylus *fuscus*, a potential anuran species in the UOV.

Photo 31- *Boana crepitans*, a potential anuran species in the UOV.

Source: SCG, 2021.

Potential reptiles in project area

Potential reptile species in the AOV, which has been reported in the region are 12 species belonging to 10 families are known, from two orders *Testudinata and Squamata* (Table 8).

Table 8- Reptiles potentially present in the Villanueva Operational Unit area

Order	Family	Species	Common Name
Testudinata	Testudinidae	*Chelonoidis carbonaria*	Morrocoy
	Podocnemididae	*Podocnemis vogli*	Sabanera
Squamata	Amphisbaenidae	*Amphisbaena alba*	Tatacoa
	Gekkonidae	*Hemidactylus brookii*	Salamanqueja
	Dactyloidae	*Anolis auratus*	Gecko
	Sphaerodactylidae	*Gonatodes concinnatus*	Gecko
	Sphaerodactylidae	*Gonatodes albogularis*	Gecko
	Iguanidae	*Iguana*	Iguana
	Teiidae	*Cnemidophorus lemniscatus*	Lizard
	Teiidae	*Tupinambis teguixin*	Mato
	Colubridae	*Chironius carinatus*	Jacket
	Viperidae	*Bothrops atrox*	Four noses

Source: Various authors compilation SCG, 2021.

In the case of reptile species, these were grouped into four guilds: carnivorous, herbivorous, insectivorous and omnivorous. The best represented guild is the carnivore, which is characterised by the exclusive consumption of other vertebrates, the insectivores are also well represented, and are characterised by the consumption of arthropods (insects, arachnids, crustaceans). In the other two guilds, the herbivores consume leaves, flowers, shoots and foliage in general and the omnivores consume various types of resources.

With regard to the ecological role played by reptiles in the different vegetation covers, it was observed that they are population controllers (of insects) and seed dispersers, the former function being the most representative in the different vegetation covers.

Reptile species niches are found to a greater extent associated with gallery forests, where species find feeding sites, refuges, perches and breeding sites. Gallery forests offer reptile species humid microhabitats with lower temperatures than in other sectors (Urbina-Cardona & Londoño-Murcia 2003). In turn, this vegetation structure maintains a stable environment in the forest microhabitats throughout the seasons (Urbina-Cardona et al. 2006). (Photos 32-35).

Photo 32- *Bothrops atrox*, potential snake species at the UOV.

Photo 33- *Amphisbaena alba*, potential reptile species in the UOV.

Photo 34- *Gonatodes albogularis* , a potential lizard species in the UOV.

Photo 35 - *Myrmecophaga carbonaria*, a potential turtle species in the UOV.

Source: SCG, 2021.

Avifauna

A regional potential of 105 bird species is reported, classified in 19 orders and 41 families (Table 9), which corresponds to 5.4% of the total number of birds recorded for the country, calculated at 1,954 species (SiB Colombia Coordinating Team, 2020).

Table 9- Birds potentially present in the Villanueva Operational Unit area

Order	Family	Species	Common name
Anseriformes	Anatidae	*Dendrocygna autumnalis*	Güiri
		Dendrocygna viduata	Warty Duck
Galliformes	Cracidae	*Ortalis ruficauda*	Guacharaca
	Odontophoridae	*Colinus cristatus*	Partridge
Ciconiiformes	Ardeidae	*Ardea alba*	Not established
		Bubulcus ibis	Not established
		Egretta thula	Not established
		Philherodius pileatus	Not established
		Syrigma sibilatrix	Pitador
	Threskiornithidae	*Cercibis oxycerca*	Zamura
Cathartiformes	Cathartidae	*Cathartes aura*	Guala

Order	Family	Species	Common name
		Coragyps atratus	Gallinazo
Accipitriformes	Accipitridae	*Ictinia plumbea*	Eagle
		Buteogallus meridionalis	Eagle
		Rupornis magnirostris	Sparrowhawk
		Geranoaetus albicaudatus	Not established
Falconiformes	Falconidae	*Falco sparverius*	Not established
		Falco femoralis	Not established
		Milvago chimachima	Ticker
		Herpetotheres cachinnans	Not established
		Caracara cheriway	Carraco
Gruiformes	Rallidae	*Porphyrio martinica*	Chinita of water
Charadriiformes	Charadriidae	*Vanellus chilensis*	Caica
	Burhinidae	*Burhinus bistriatus*	Alcaraván
	Jacanidae	*Jacana jacana*	Lagunero Cockerel
Colombiformes	Columbidae	*Columbina squamata*	Rocerita
		Columbina talpacoti	Palomita
		Leptotila rufaxilla	Rabiblanca
		Patagioenas cayennensis	Paloma
		Zenaida auriculata	Not established
Psittaciformes	Psittacidae	*Amazona ochrocephala*	Lora Real
		Amazona amazonica	Curumayo Parrot
		Ara macao	Not established
		Eupsittula pertinax lehmanni	Cotorrita
Cuculiformes	Cuculidae	*Crotophaga ani*	Cirihualo
		Crotophaga major	Not established
		Piaya cayana	Rabocandela
Strigiformes	Strigidae	*Megascops choliba*	Not established
		Athene cunicularia	Morroco
		Tyto alba	Owl
Caprimulgiformes	Caprimulgidae	*Nyctidromus albicollis*	Bujio
		Podager nacunda	Bujio
Apodiformes	Jacanidae	*Tachornis squamata*	Not established
	Trochilidae	*Amazilia fimbriata*	Quincha or Chupaflor
		Phaethornis malaris	Quincha or Chupaflor
Trogoniformes	Trogonidae	*Trogon viridis*	Not established
Coraciiformes	Alcedinidae	*Chloroceryle aenea*	Not established
	Momotidae	*Momotus subrufescens*	Donkey
Galbuliformes	Galbulidae	*Galbula tombacea*	Quincho
		Brachygalba lugubris	Quincho

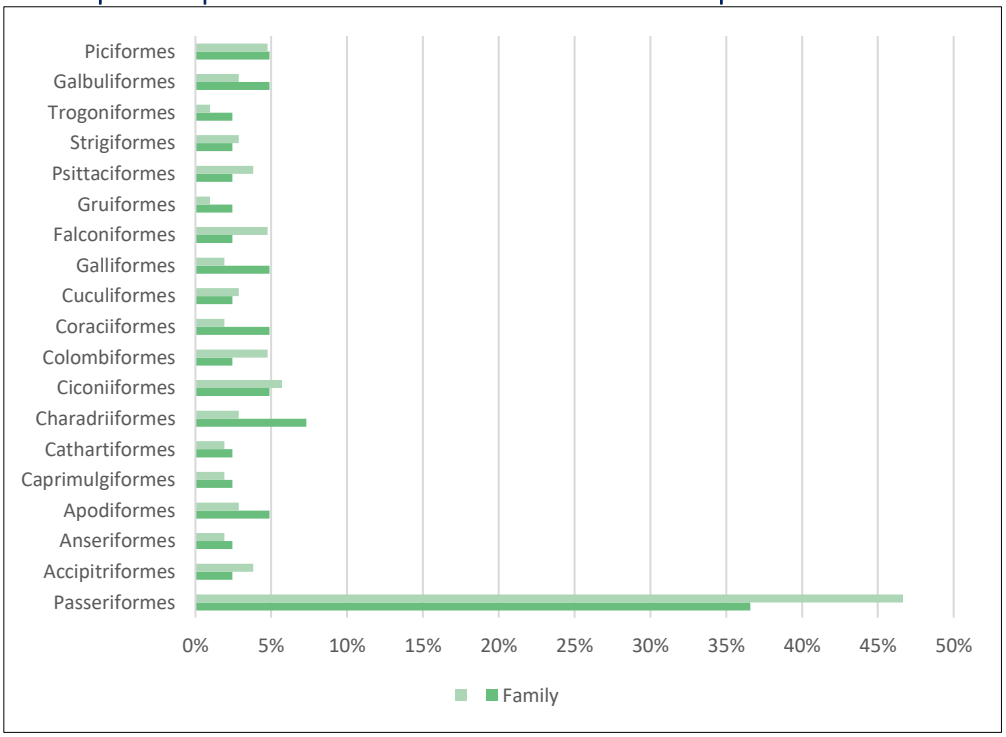
Order	Family	Species	Common name
	Bucconidae	*Chelidoptera tenebrosa*	Not established
Piciformes	Ramphastidae	*Pteroglossus castanotis*	Pellicano
		Pteroglossus pluricinctus	Pellicano
		Ramphastus tucanus	Toucan
	Picidae	*Dryocopus lineatus*	Royal Carpenter
		Picumnus squamulatus	Carpenter
Passeriformes	Furnariidae	*Cranioleuca vulpina*	Not established
		Dendrocincla fuliginosa	Not established
		Synallaxis azarae	Marucha
	Thamnophilidae	*Sakesphorus canadensis*	Not established
		Myrmoborus leucophrys	Not established
		Myrmoborus myotherinus	Not established
		Taraba major	Not established
		Thamnophilus doliatus	Not established
		Myrmeciza atrothorax	Not established
	Tyrannidae	*Camptostoma obsoletum*	Not established
		Sublegatus arenarum	Not established
		Myarchus tyrannulus	Copetón
		Myiozetetes cayanensis	Not established
		Myiodynastes maculatus	Not established
		Empidonomus varius	Not established
		Pitangus sulphuratus	Verhiamarillo
		Todirostrum cinereum	Not established
		Leptopogon amaurocephalus	Not established
		Tyrannus melancholicus	Verhiamarillo
		Tyrannus savana	Scissors
		Tyrannus tyrannus	Not established
	Pipridae	*Manacus manacus*	Not established
		Pipra filicauda	Not established
	Tityridae	*Tytira cayana*	Not established
	Vireonidae	*Vireo olivaceus*	Not established
	Corvidae	*Cyanocorax violaceus*	Chancha
	Troglodytidae	*Thryophilus rufalbus*	Not established
	Donacobiidae	*Donacobius atricapilla*	Not established
	Turdidae	*Turdus ignobillis*	Mirla Embarradora
		Turdus nudigenis	Mirla
	Mimidae	*Mimus gilvus*	White myrtle
	Tharupidae	*Coereba flaveola*	Not established
		Ramphocelus carbo	Cheese eater
		Saltator maximus	Not established
		Stilpnia cayana	Not established
		Thraupis episcopus	Tile

Order	Family	Species	Common name
	Emberizidae	*Ammodramus humeralis*	Ingerto
		Sicalis flaveola	Canary
		Sporophila intermedia	Not established
		Jacarina Volatina	Not established
		Arremonops taciturnus	Not established
	Icteriadae	*Cacicus cela*	Arrendajo
		Gymnomistax mexicanus	Cocha
		Icterus auricapillus	Not established
		Molothrus bonariensis	Not established
		Molothrus oryzivorus	Cocha
		Psarocolius decumanus	Backpacker
		Quiscalus lugubris	Not established
	Fringillidae	*Euphonia xanthogaster*	Not established

Source: Various authors compilation SCG, 2021.

The best represented order is the Passeriformes with 37% of the families and 47% of the species, followed by the Charadriformes with 7% of the families and 3% of the species. The other orders have very even percentages between 2% to 5% of families and 1% to 5% of species (Graph 5).

Graph 5 - Representation of avifauna in the Villanueva Operational Unit area

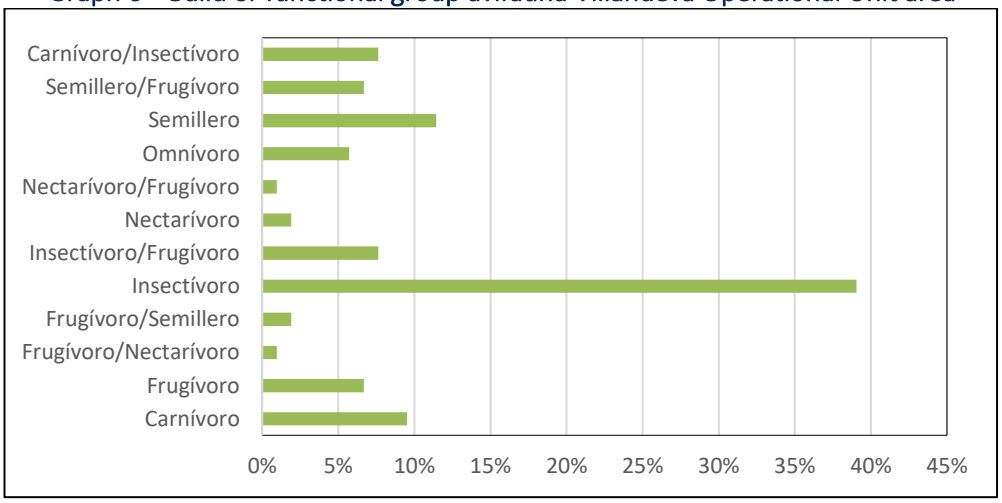


Source: SCG, 2021.

In this document birds are grouped by the resource they consume, but not in the way they obtain it, e.g. whether they obtain insects by foraging on leaves or in the air. This is why the specific term used is functional group rather than food guild. Each functional group has a specific diet type (Simberloff and Dayan 1991).

A variety of diets were found ranging from fruits, nectar and seeds to vertebrate insects and carrion (Graph 6). Some of the species were classified as one diet and others as a combination of two or more, e.g. insects/fruits or seeds/fruits. Birds that consume three or more types of food are classified as omnivorous (Hilty and Brown 1986). The diet assigned to each species corresponds to its preferred diet, which does not mean that it is the only food it may consume.

Graph 6 - Guild or functional group avifauna Villanueva Operational Unit area



Source: SCG, 2021.

Insect-eating birds have the highest representation, accounting for 39% of the total number of species reported here. Among the insectivores, most members of the flycatchers (Tyrannidae) and the ant-eaters (Thamnophilidae) can be identified.

Among the families of insectivores reported, there is a great variety of foraging techniques. For example, flycatchers catch their prey in the air, while road-guards fly from stationary perches on the ground to catch their prey (Hilty and Brown 1986). Insectivorous birds are very important because they provide the environmental service of insect population control (IGAC 1999 cited in Amado-Sánchez 1998).

The second best represented trophic guild or functional group, far behind the insectivores, is the seed-eaters (11% of the total number of species), thanks to the important grassland cover in the area where the project is located.

The third trophic guild or functional group (10% of the total number of species) corresponds to carnivores (including the group of scavengers), which are those that consume other vertebrates, the majority of which make use of open areas or areas close to bodies of water. One of the groups that consume the most vertebrates are eagles (Accipitridae) and falcons (Falconidae), which in the country have their greatest diversity in lowlands (McMullan et al. 2010).

The rest of the functional groups are represented between 1% and 7% of the total number of species reported here (Photos 36-39).

Photo 36- *Tyrannus melancholicus*, an insectivorous species, at the UOV.

Photo 37 - *Cacicus cela*, a frugivorous species, at the UOV.

Photo 38- *Sicalis flaveola*, seed-bearing species, at the UOV.

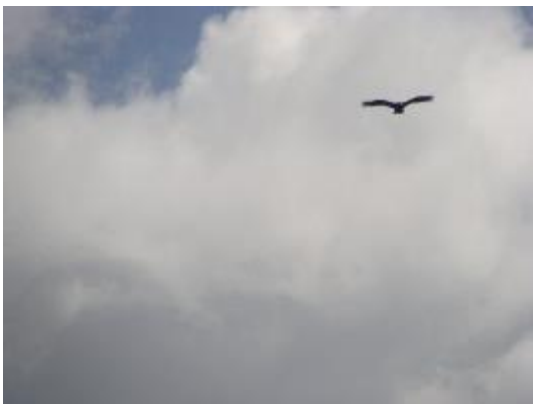


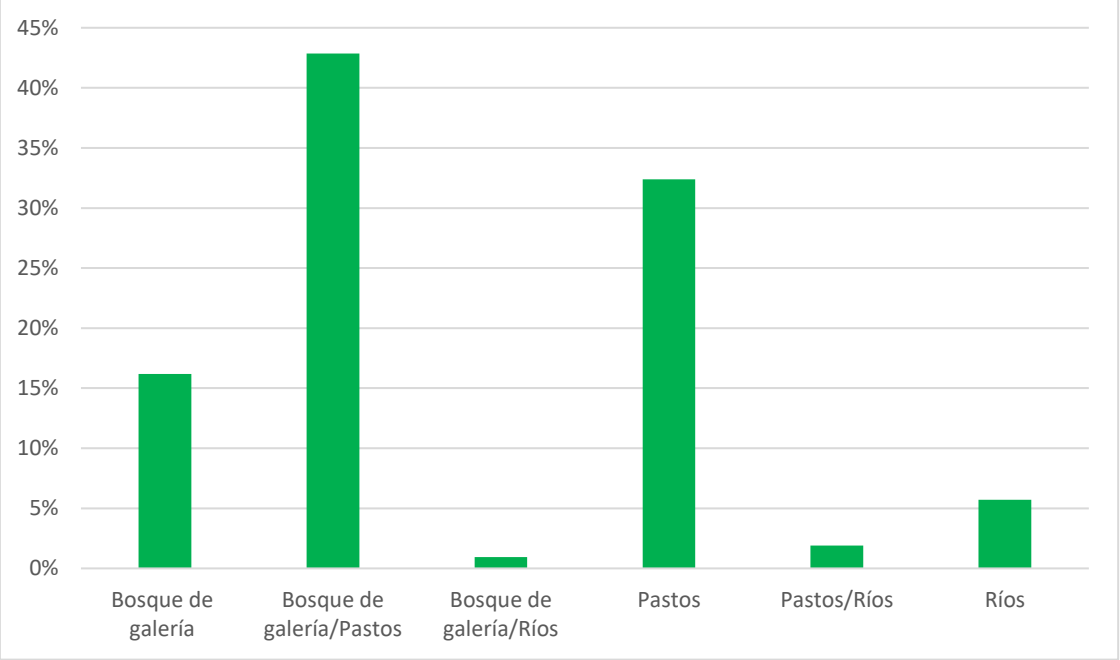
Photo 39 - *Cathartes aura, a* scavenger species included in the carnivore guild, at the UOV.

Source: SCG, 2021.

The association of birds with land cover in the area of influence of the Villanueva Operational Unit (UOV) is strongly marked by the relationship between two land covers: gallery forest/grasslands. 43% of the birds reported develop their vital functions there (Graph 7), including species of flycatchers of the *Tyrannidae* family, as well as warblers and warblers of the *Tharupidae* family.

This is followed in percentage (32%) by species associated with grasslands, including pigeons of the family *Columbidae* and seed-eaters of the family *Emberizidae*. In third place, in percentage (16%), we find species closely associated with gallery forests, including important species such as turkeys of the family *Cracidae*, toucans of the family *Ramphastidae*, antbirds of the family *Thamnophilidae* and manakins of the family *Pipridae.*

Graph 7 - Association to avifauna cover in the Villanueva Operational Unit area



Source: SCG, 2021.

Mastofauna

Thanks to the known location and geographical distribution, and based on bibliographic references and other studies, in the area where the Villanueva Operational Unit is located, it is possible to record about 34 species of mammals, distributed in eight orders and 17 families (Table 10, Photos 40-41).

Table 10- Mammals potentially present in the Villanueva Operational Unit area

Order	Family	Species	Common name
Didelphimorphia	Didelphidae	*Didelphis marsupialis*	Opposum
Pilosa	Bradipodidae	*Bradypus variegatus*	Sloth bear
	Myrmecophagidae	*Myrmecophaga tridactyla*	Palm bear
		Tamandua tetradactyla	Honeypot
Cingulata	Dasypodidae	*Dasypus novemcinctus*	Armadillo
Chiroptera	Emballonuridae	*Saccopteryx leptura*	Bat
	Phyllostomidae	*Phyllostomus elongatus*	Bat
		Carollia perspicillata	Bat
		Carollia castanea	Bat
		Uroderma bilobatum	Bat
		Uroderma magnirostrum	Bat
		Artibeus lituratus	Bat
		Artibeus planirrostris	Bat
		Dermanura phaeotis	Bat
		Micronycteris megalotis	Bat
		Micronycteris minuta	Bat
		Mimon crenulatum	Bat
		Tonatia saurophila	Bat
		Desmodus rotundus	Bat

Order	Family	Species	Common name
		Vampyressa thyone	Bat
Primates	Cebidae	*Alouatta seniculus*	Howler
		Saimiri sciureus	Squirrel monkey
		Cebus apella	Corn monkey
Carnivora	Canidae	*Cerdocyon thous*	Fox
	Procyonidae	*Procyon cancrivous*	Big-footed fox, raccoon
	Felidae	*Leopardus pardalis*	Tigrillo
		Herpailurus yagouaroundi	Jaguarundi
Artiodactyla	Cervidae	*Odocoileus virginianus*	White-tailed deer
Rodentia	Muridae	*Rattus norvegicus*	Mouse
	Sciuridae	*Sciurus granatensis*	Squirrel
	Erethizontidae	*Coendus prehenselis*	Porcupine
	Hydrochaeridae	*Hydrocaerus hydrochaeris*	Capybara
	Dasyproctidae	*Dasyprocta fuliginosa*	Agouti
	Cuniculidae	*Cuniculus paca*	Paca

Source: Various authors compilation SCG, 2021.

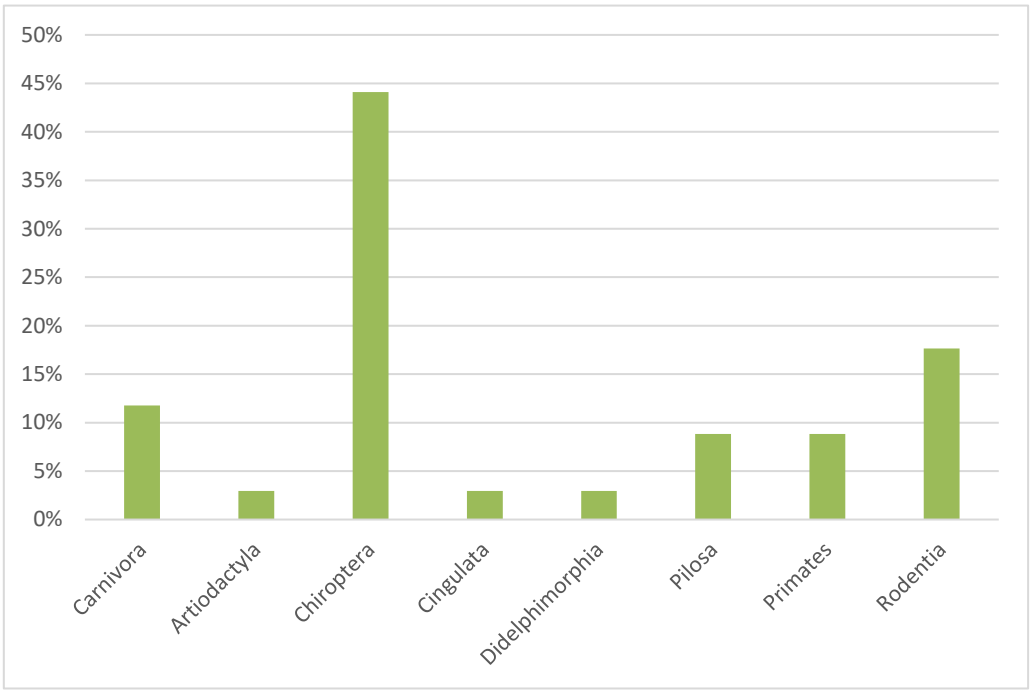
Photo 40- *Odocoileus virginianus*, recorded inside the plantation, at the UOV.

Photo 41 - *Tracks of Odocoileus virginianus*, in internal tracks of the plantation, at the UOV.

Source: SCG, 2021.

This corresponds to 6.3% of the 546 mammal species recorded for the whole country (Ramírez-Chaves H E., et al. 2021). Among the orders recorded, bats are the most diverse group with 44% (15 species), followed by rodents 18% (6 species) and carnivores 12% (4 species).
Graph 8).

Graph 8 - Proportion of mammals by order area Operational Unit Villanueva



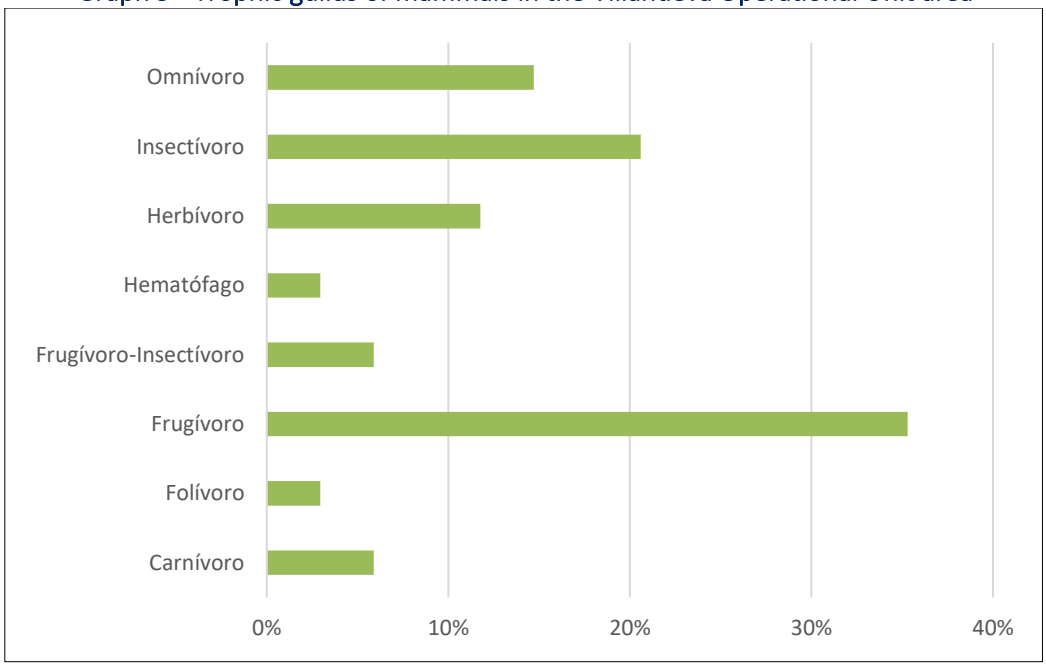
Source: SCG, 2021.

The mammals reported in this paper are grouped into eight guilds: (a) folivores that consume leaves, flowers, shoots and foliage in general, (b) carnivores that feed on other vertebrate species, (c) frugivores that consume fruits and/or seeds, herbivores that consume only leaves, d) haematophagous, which consume blood, e) insectivores, which seek insects as a protein resource, f) omnivores, which consume more than three resources, and g) mixed diets (frugivores-insectivores), which use one resource but complement it with others.

The guild with the highest number of species is the frugivore guild with 35% (12 species), followed by the insectivore guild with 21% (7 species), i.e., between these two guilds, more than 50% of the mammal species reported are included. The rest of the guilds range between 3% and 15% (omnivores) (

Graph 9, Photos 42-43).

Graph 9 - Trophic guilds of mammals in the Villanueva Operational Unit area



Source: SCG, 2021.

Photo 42 - *Tamandua tetradactyla*, an insectivorous species recorded at the UOV.

Photo 43- *Dasypus novemcinctus, an* omnivorous species recorded at the UOV.

Source: SCG, 2021.

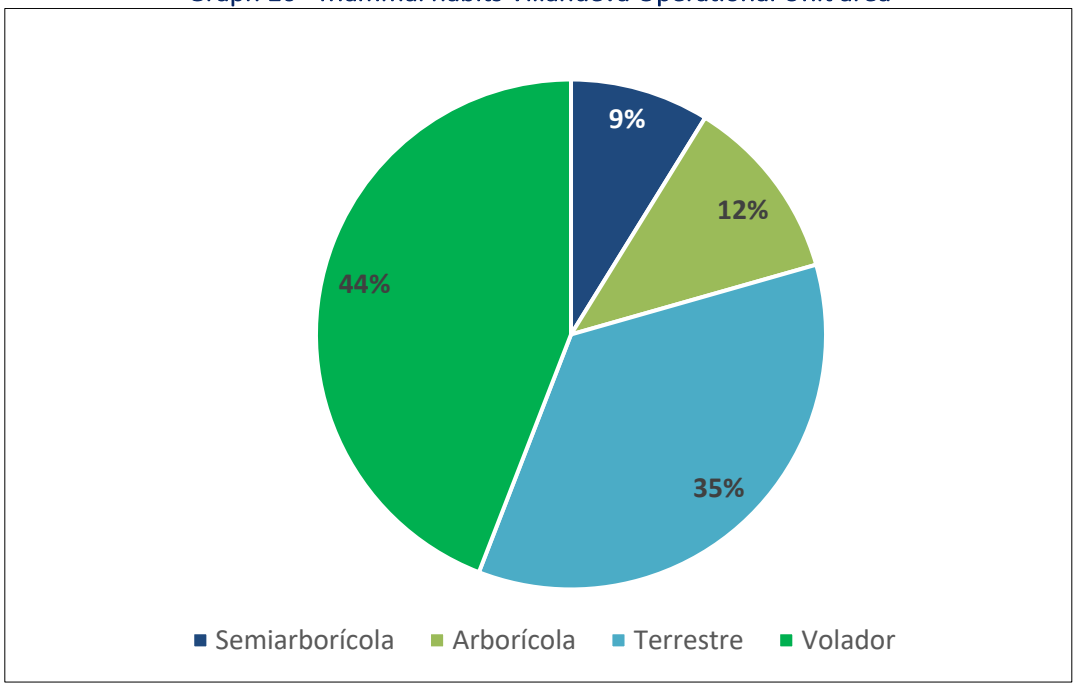
In response to the supply of the environment and the complexity of habitats, mammals exploit the resource with a range of diets that include various specialisations. Thus, some mammals are assiduous visitors of forest cover, with flowering or fruiting plant species, resources that are usually complemented by insects and arachnids. Generalist species are therefore more likely to adapt and in terms of structure increase their populations, being more successful in changing conditions due to anthropogenic activities (Moreno et al. 2008).

Anthropic intervention influences the composition and structure of bat species in the short and medium term, decreasing the richness of frugivorous species by up to 40%, with generalists such as *Carollia perspicillata* being more successful in this case. In the case of nectarivorous and insectivorous species, no such decrease has been observed (Pérez-Torres & Ahumada 2004).

In a habitat analysis, the ecological basis on which observations are made is usually the vegetation. This approach gives an indication of the amount of food and wildlife that a site can support (Andrade 1993). It is also important to determine the presence and proximity of water bodies or places that can serve as shelter and refuge for wildlife (Gysel & Lyon 1987).

Life habits are related to the way in which mammals use the habitats in which they develop. The mammals in the Villanueva Operational Unit (UOV) area can be grouped into four categories. The best represented habitat is the flying one with 15 species making up 44% of the total, followed by terrestrial with 12 species (35%), arboreal with four species (12%) and semi-arboreal with three species (9%), (Graph 10).

Graph 10 - Mammal habits Villanueva Operational Unit area



Source: SCG, 2021.

The species with a flying habit were mainly recorded in gallery forests, riparian forests and high stubble, these ecosystems offer, in addition to food, shelter, roosts and breeding sites. In these areas the bat species look for caves or hollow trees (*Saccopteryx lepura*, *Micronycteris megalotis* and *Micronycteris minuta*), while others are associated with palms, banana bushes or others (*Uroderma bilobatum*, *Uroderma magnirostrum* and *Vampyressa thyone*). As can be seen, forests play an important role in acting as biological corridors.

In the case of terrestrial mammals, they were mainly recorded in stubble fields and natural savannahs, sites used both for their movements and for foraging, such as *Mymercophaga tridactyla*, *Dasypus novemcinctus*, *Cerdocyon thous*, *Odocoileus virginianus*. Other species use the gallery forest, such as the Ocelot *Leopardus pardalis*, and the Agouti *Dasyprocta fuliginosa*.

Species of both arboreal and semi-arboreal habits are recorded in forests, this is the case of: porcupine *Coendus prehenselis*, *Bradypus variegatus*, Anteater *Tamandua tetradactyla*, howler Monkey *Alouatta seniculus,* Titi monkey, *Saimiri sciureus*, Capuchin monkey *Cebus apella* and *Sciureus granatensis*, these species differentially use the strata even in sectors with some degree of disturbance.

Endemic species with endangered or traditional regional use categories

Endemic species

An endemic species is one whose geographical distribution is contained within the political boundaries of a country. However, the term "endemic" has also been used for species whose geographical distributions are restricted, limited to relatively small areas (50,000 km2 usually referred to in the literature). According to the review of available information for wildlife reported in the present study, one species of reptile, the Savanna side-necked turtle (*Podocnemis vogli*) is identified as endemic to the Orinoco region. For the avifauna and mastofauna groups, no species with restricted or endemic distributions were identified.

Species with threat categories

Threatened species are those that have been declared as such by international treaties or conventions approved and ratified by Colombia or have been declared in some category of threat: Critically Endangered (CR), Endangered (EN) or Vulnerable (VU).

In accordance with the above, for the wildlife recorded directly in the area of the Villanueva Operational Unit (UOV), one reptile with a category of threat was recorded for the herpetofauna group: the Red-footed tortoise (*Chelonoidis carbonaria*), with a category of Vulnerable (VU). For the avifauna group, no species were identified as being in any category of threat.

In the case of the mastofauna group, according to the primary information, one species was identified as a threatened species, namely the giant anteater (*Myrmecophaga tridactyla*), with a category of Vulnerable (VU).

CITES-listed species

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is a treaty governed by the rules of international law to regulate that international trade in wild plants and animals, their parts and products is not detrimental to the survival of the species. Colombia approved the CITES convention through Law 17 of 1981, the administrative authority at the time was the Ministry of Environment, today known as the Ministry of Environment and Sustainable Development (MADS).

Of the wildlife species directly recorded in this study, 26 species from the three groups are listed in the CITES Appendices (Table 11).

Table 11- Fauna recorded and listed in the CITES Appendices Villanueva Operational Unit area

Family	Species	CITES Appendix
Herpetofauna - Reptiles		
Testudinidae	*Chelonoidis carbonaria*	II
Podocnemididae	*Podocnemis vogli*	II
Iguanidae	*Iguana*	II
Avifauna		

Family	Species	CITES Appendix
Accipitridae	*Ictinia plumbea*	II
	Buteogallus meridionalis	II
	Rupornis magnirostris	II
	Geranoaetu albicaudatus	II
Falconidae	*Falco sparverius*	II
	Falco femoralis	II
	Milvago chimachima	II
	Herpetotheres cachinnans	II
	Caracara cheriway	II
Psittacidae	*Amazona ochrocephala*	II
	Amazona amazonica	II
	Ara macao	II
	Aratinga pertinax lehmanni	II
Strigidae	*Megascops choliba*	II
	Athene cunicularia	II
	Tyto alba	II
Trochilidae	*Amazilia fimbriata*	II
	Phaethornis malaris	II
Mastofauna		
Megalonychidae	*Bradypus variegatus*	II
Myrmecophagidae	*Myrmecophaga tridactyla*	II
Canidae	*Cerdocyon thous*	II
Felidae	*Leopardus pardalis*	I
	Puma yagouaroundi	II
Total 26 species		

Source: SCG, 2021.

Migratory bird species

Of the 105 bird species recorded for the area of the Villanueva Operational Unit (UOV), three species are migratory, namely the Flycatchers (Fam: Tyranidae): Tyrannus and *Tyrannus savana*, which frequent open areas such as grasslands, forest edges and vegetation near bodies of water. *Tyrannus* is a boreal migrant, i.e. from the north of the continent, and is present in Colombia from October to April. *Tyrannus savana is a* southern migrant, i.e. from the south of the continent, and is present in the country from March to November; however, there are already some population groups of this species that have become residents. Also *Vireo olivaceus*, family Vireonidae, which is a boreal migrant.

Traditionally used species

In general, wildlife species throughout history have constituted a resource that is exploited by communities from generation to generation. Animals constitute a source of protein for some communities in rural areas, as well as skins, bones and antlers have been used for different purposes, ranging from ornamentation of a house to a product offered to the westernised consumer society.

Wild animals, as they are usually called, particularly in their neonatal or juvenile stages, are sought after as pets. Bird species, among others, are extracted and traded, endangering the natural populations.

The region in which the Villanueva Operational Unit (UOV) is located is no stranger to this circumstance. Bird species are highly sought after, particularly those that show some skill, beauty, singing or bright colours, which is why they are turned into cage birds, while others are sought after for their meat, as is the case of the turkeys of the Cracidae family.

The taxonomic group with the greatest pressure from traditional use are mammals, of the 34 species recorded, three of them are hunted for population control (they prey on domestic animals), these are: *Leopardus pardalis*, *Herpailurus yagouaroundi* and *Cerdocyon thous.* Five others are hunted for their meat, such as: *Odocoileus virginianus* deer, the Paca *Cuniculus paca*, the armadillo *Dasypus novemcinctus*, the agouti *Dasyprocta fuliginosa* and the Capybara *Hydrochaerus hydrochaeris*.

5.3 Socio-economic aspects

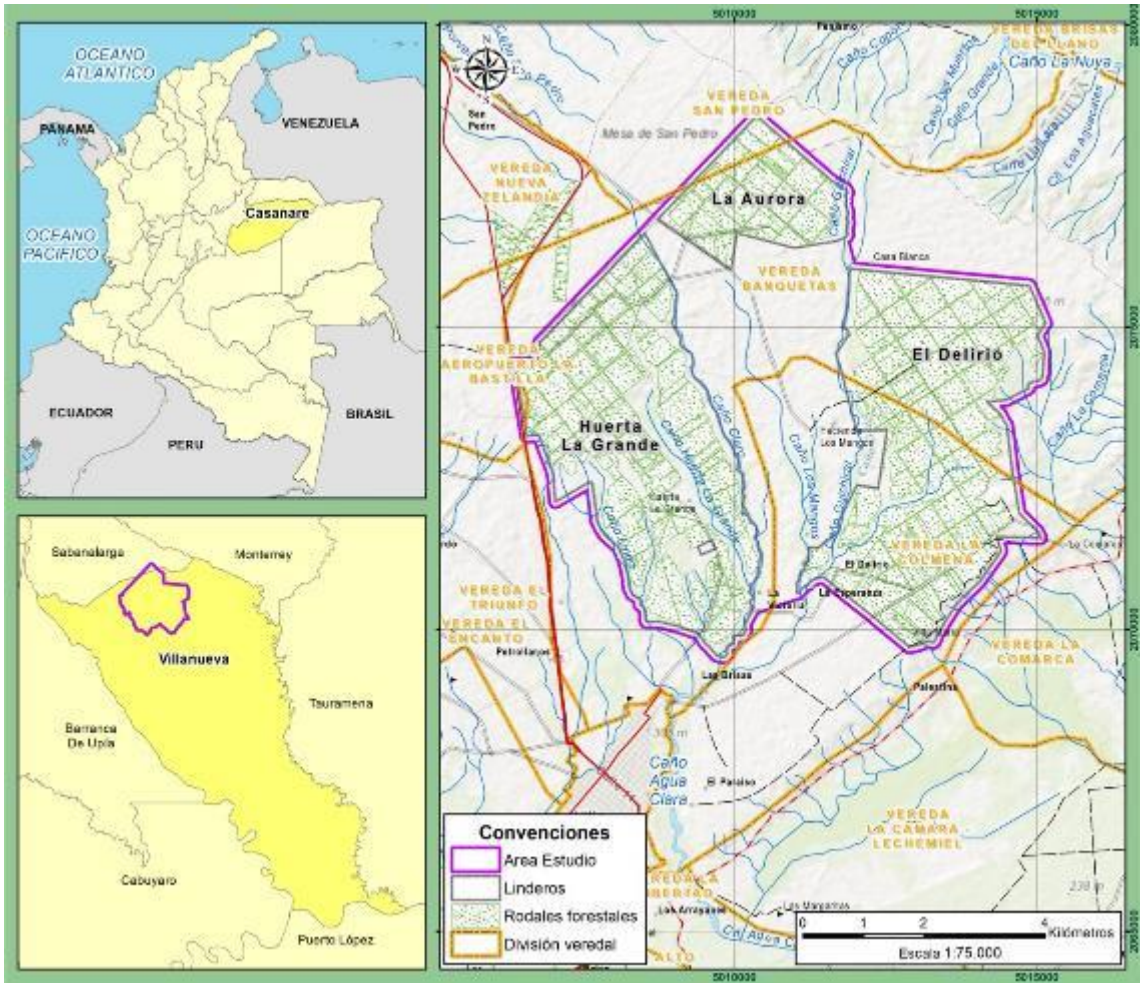
5.3.1 Political Administrative Component

The municipality of Villanueva is located in the southern part of the Department of Casanare, in the region of the eastern plains, on the lower part of the foothills, on the banks of the Agua Clara and Perales or Arietes streams, at 4° 57" North latitude and 73° 94" West longitude of the Greenwich meridian (Figure 18). The urban centre of the municipality is located 300 metres above sea level and has an average temperature of 25.7 °C, with the months of January to March being the hottest and April to October the wettest months during the rainy season, according to the IDEAM station Huerta La Grande.

These characteristics indicate a warm and humid climate and a tropical rainforest life zone (BHT). The municipal territory is made up of a geographical area within the limits established by Decree 2287 of 2 August 1982 of the Ministry of Government, which came into force on 1 January 1983. The limits of the municipality are:

- To the North: With the municipalities of Sabanalarga and Monterrey.
- To the south: with the department of Meta (municipality of Puerto López).
- To the east: with the municipalities of Monterrey and Tauramena.
- To the west: with the department of Meta (municipality of Barranca de Upía).

Figure 18 - Location of the Municipality of Villanueva



Source: SCG, 2021

The municipality of Villanueva is made[1] up of twenty-two (22) veredas and three (3) corregimientos, distributed according to the illustration (

Figure 19):

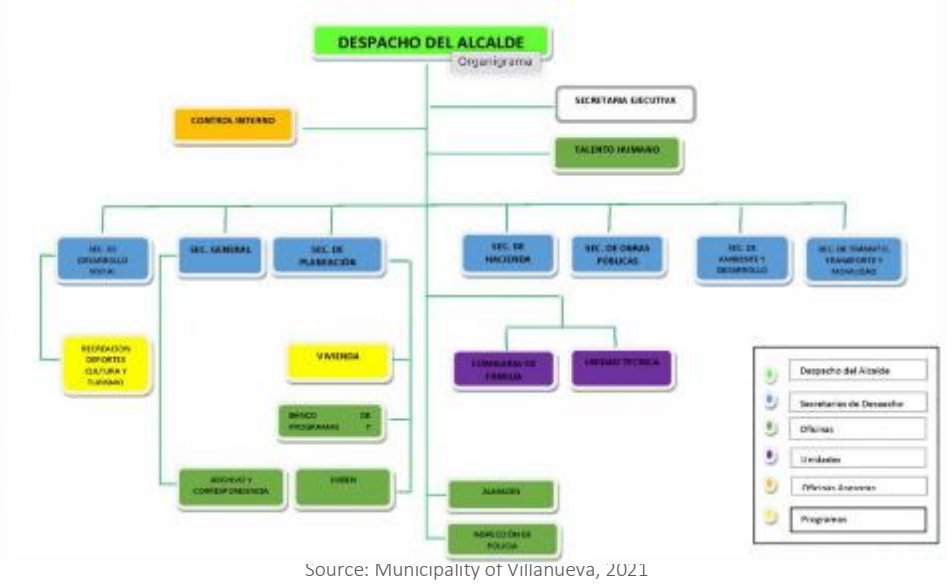
Figure 19 - Political-administrative division of the municipality of Villanueva

Source: Municipality of Villanueva, 2013.

The urban area is made up of 17 neighbourhoods. The municipal administrative structure is made up of the Mayor's Office, the Executive Secretariat and the General, Environment and Development, Social Development, Planning, Finance, Public Works and Transit, Transport and Mobility Secretariats (Figure 20).

[1] Information taken from Municipal Agreement No. 010 of 27 July 2010, which adopts the Villanueva, Casanare Land Use Planning Scheme.

Figure 20 - Municipal administrative organisation chart

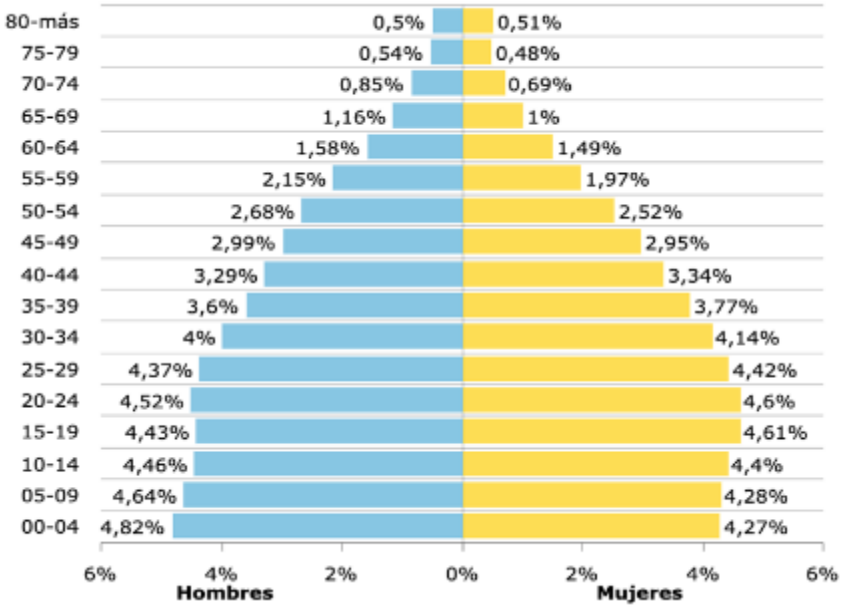


Source: Municipality of Villanueva, 2021

5.3.2 Demographic component

Based on the projections of the National Administrative Department of Statistics (DANE) for 2020, the total estimated population for the municipality of Villanueva is 36,184 inhabitants, located in an area of 825 km2. The population pyramid is as follows:

Graph 11 - Population pyramid of Villanueva



Source: DANE national population and housing census 2020.

With regard to the distribution of the population by age, it can be indicated that the municipality has a young population structure (Graph 11). Of the total population, 9,721 people (27%) are under 14 years of age, 2,073 people (6%) are over 64 years of age and 24,390 people (67%) are between 15 and 64 years of age. This indicates that the dependency rate is 48,3%, which means that the active population (15 and 64 years of age) has to support the dependent population (under 14 and over 64).

According to the population census data in the municipality, the total number of men is 18,293 (50.6%) and of women is 17,891 (49.4%). The population located in the urban area corresponds to 26,991 inhabitants (74.6%) and that located in the rural area corresponds to 9,193 inhabitants (25.4%).

There are different ethnic groups in the municipality; among the 36,184 inhabitants there is a majority presence of mestizo population with 95.8% (34,688 inhabitants), followed by the black or Afro-Colombian population with 3.8% (1,326 inhabitants) and the population that recognises itself as indigenous with 0.4% (163 inhabitants)[2]. There are no indigenous or Afro-descendant groups or communities in the municipality.

Of the total economically active population, it is estimated that there is an unemployment rate of less than 11% (below the country's total unemployment rate of 12.3% for 2020).

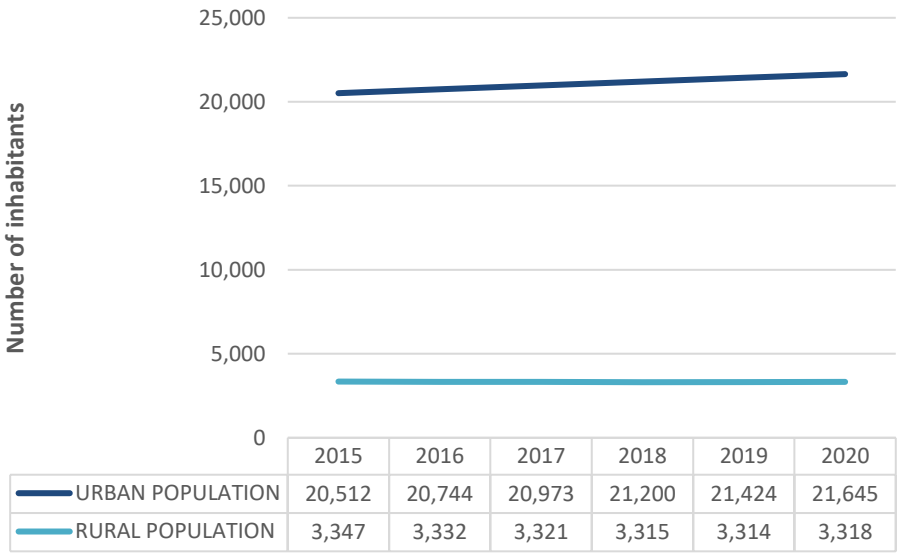
[2] DANE- Population censused in the National Population and Housing Census 2018

Table 12 - Population Villanueva

YEAR	URBAN POPULATION	%	RURAL POPULATION	%	TOTAL INHABITANTS
2015	20.512	85,97	3.347	14,03	23.859
2016	20.744	86,16	3.332	13,84	24.076
2017	20.973	86.33	3.321	13,67	24.294
2018	21.200	86,48	3.315	13,52	24.515
2019	21.424	86,60	3.314	13,40	24.738
2020	21.645	86,71	3.318	13,29	24.963

Source: DANE. SCG tabulation

Graph 12 - Demographic Behaviour of Villanueva 2015 - 2020



Source: DANE. SCG Chart

The population behaviour for the municipality between 2015 and 2020, according to DANE, corresponds to a highly urban population that is growing steadily, contrary to the population decrease that is evident in the rural population for the same period of time analysed.

Taking into account the population figures reported for 2020 (36,184 inhabitants), there is a sustained population growth that is outside the ranges of projections made by the DANE. This can be explained mainly by the demand for labour generated by the palm industry and other agro-industries (rice and forestry crops), making the municipality of Villanueva the recipient of people seeking employment opportunities in the aforementioned industries or in oil companies developing exploratory activities, which allows inferring that the demographic behaviour will continue its upward trend.

5.3.3 Spatial Component

This section presents the information of the municipality of Villanueva related to the available supply for education, health, interconnection and communication (roads) and domiciliary public services.

In the municipality there are 12,024 dwellings[3], the number of households is 11,757, which indicates that there is an average of 0.97 households per dwelling and per household there is an average of 2.69 persons.

5.3.3.1 Education

The municipality of Villanueva has four (4) public educational institutions, with a total of 16 official schools in the urban and rural[4] areas.

The municipal development plan 2020-2023 shows that in 2019 a total of 7,802 students are reported as enrolled, of which 80% have access to the school feeding programme. Educational institutions have 3,107 desktop and laptop computers available for students. The teacher-student ratio is 28 students per teacher.

Table 13 - Coverage by level of education

EDUCATIONAL LEVEL	COVERAGE 2019 (%)
Kindergarden	120,82
Primary	113,29
Secondary	127,1
Average	79,84

Source: Departmental Education Secretariat of Casanare 2020

According to Table 13, for the kindergarden, primary and secondary levels, coverage results are greater than 100%, because the entire school-age population is covered by the education system and, additionally, there are over-age students enrolled.

There are also private institutions in the municipality that offer pre-school and primary education, as well as institutions for work and human development. Adult education training is offered in urban and rural areas, as well as technical education in modalities such as: systems technician, agricultural production, secretarial work, administrative assistant, accounting assistant. Professional careers are offered in international business administration, public accounting, systems engineering; technological careers in agro-industrial, public management, logistics management and costs and budgets; professional technical careers in systematised accounting, executive secretarial and tourism, occupational health and pharmacy management and specialisations in computer management and auditing and comptrollership[5]. The academic programmes developed in the municipality are in accordance with the productive vocation and socio-economic dynamics.

5.3.3.2 Health

The municipal development plan 2020-2023 highlights the conditions affecting health in Villanueva:

- The variation of the population by age group between 2005 and 2020 in general has had an increasing trend for all age groups with the exception of early childhood and infancy.

[3] National Population and Housing Census, DANE 2018.

[4] Development Plan "Together we build Villanueva 2020 - 2023".

[5] Ibidem

- Given that growth is driven by births, deaths and migration, it is pertinent to highlight that in Villanueva the birth rate was projected to decrease from 20.1 in 2005 to 19.09 live births per 1,000 people in 2017. Although between 2005 and 2020 the population projections show a decrease in the slope, the trend is expected to continue to decrease. Mortality is expected to remain stable with a slight downward trend.

- In 2018 in Villanueva, the overall rate was 2.7 children per woman and the overall rate was 96.3 live births per 1,000 women, an increase from 2017, when the overall rate was 2.3 children per woman.

- Reduced rates may signify increased birth control and be an indicator of the improvement in the general conditions of the population, in factors that have a positive impact on this control, such as increased schooling and greater participation of women in the labour market, greater access to planning methods, among others.

- Of the 99 annual births that occurred in adolescents, 95.4% occurred between the ages of 15 and 19 years indicating that for every 1,000 women in this age group there were 97 births in 2018; that is, 45 fewer than in 2008. This indicates that sexual education actions should continue to be carried out to prevent teenage pregnancies.

- The remaining 4.5% of adolescent births occurred between the ages of 10 and 14, meaning that for every 1,000 women in this age group there were an average of two births during 2018. It is important to note that in this population group there should not be any births since according to law 1098 of 2006 it would be considered as a possible case of sexual abuse, however, in the last four years this indicator decreased by 4 points.

- Life expectancy at birth in the municipality of Villanueva has increased from 68 years in 2005 to 76.2 for the period 2015 to 2020. By sex, life expectancy tends to be higher in women than in men, although over time the gap tends to decrease.

- 95% of migrants in the municipality of Villanueva come from Venezuela. A similar situation is observed at the departmental level. Thirty-eight per cent of the migrant population's consultations took place in the outpatient service.

The municipality has a local first level hospital, of low complexity, attached to the Empresa Social del Estado Red Salud Casanare, according to the Plan Desarrollo Municipal de Villanueva, 20-202320, the other health centres are private.

Table 14 - Health Insurance

Type of scheme	No. Affiliates
Contributory scheme	16.190
Subsidised scheme	13.452
Special regimes	382

Source: Ministry of Health and Social Protection

5.3.3.3 Interconnection and communication

According to the Municipal Development Plan 2020-2023, the municipality has a road network of 191.56 km between primary, secondary and tertiary roads. The primary road network is 17 km long, paved in its entirety, with some sections in fair condition in the section between Barranca de Upía and Aguaclara on the Troncal del Llano.

The secondary roads have a total length of 45,75 km, distributed in two road sections, as follows:

Table 15 - Secondary roads in Villanueva

Secondary roads	Total km	Km Pavement	Km. without pavement
Central Casanare Highway (Los Gemelos - Caribayona section)	31,55	31,55	
El Tropezón - San Agustín	14,20		14,20
TOTAL	45,75	31,55	14,20

Source: Municipal Development Plan 2020-2023

Tertiary roads total 202 km, of which 16.7 km are paved, the remaining 185.3 km are in fair condition, as listed in Table 16:

Table 16 - Tertiary roads in Villanueva

Secondary roads	km. Totals	km. Pavement	km. Without pavement
Intersection with the central road of Casanare Caimán Alto - Caimán Bajo - Fical	11,00		11,00
La vara - Caracolí - 7th Street	16,50		16,50
The Twins - Santa Helena de Upía	16,70	16,70	16,70
San Agustín - Puerto Rosales	17,40		17,40
Santa Helena - Caño Mirribá	5,66		5,66
Mirribá Channel - Miriam Port	14,57		14,57
Viso del Toro - Cruce Formad	11,70		11,70
Caribayona (Santa Fe)- Yellow Flower	15,90		15,90
Flor Amarillo - Santana Palm Tree Crossing	17,70		17,70
Puerto Rosales - El arbolito	10,50		10,50
The little tree - Yellow Flower	18,82		18,82
Encanto- Horquetón	9,50		9,50
San Agustín - Santa Rita	13,05		13,05
San Agustín - Las Mercedes	17,00		17,00
Villanueva - La Colmena	6,00		6,00
TOTAL	202,00	16,70	185,30

Source: Municipal Development Plan 2020-2023

In the urban area, approximately 55% of the roads are paved.

In terms of air transport, the municipality has an aerodrome that has been operating since 2010 with resolution 2807, which is managed by the foundation for the development of Upía. The aerodrome provides a service for approximately 90 people per week; the runway has a landing zone length of 1,300 metres. The municipality does not have a transport terminal, but rather an area that has traditionally been used by the agencies of the transport companies as a stop for their vehicles, which causes disorder in terms of traffic and use of public space.

In the Santa Helena sector, it is necessary to build a river port to facilitate the multimodal transport of agricultural products, foodstuffs, livestock, among others, to the Atlantic and to Puerto López as the last river port on the Meta River.

- Connectivity analysis

Villanueva has a strategic road location that gives it access to three major cities in the country: one that connects it to Villavicencio and Bogotá from the southwest, another that connects it from the northeast to Yopal, the capital of the department, and another that connects it to Tunja from the north.

It is 227 km from Bogotá, a four-hour drive, and 115 km from Villavicencio, an approximate two-hour drive. These two cities are the main destinations for the municipality's timber, rice, livestock and palm tree production (see Figure 21).

Figure 21 - Route to Bogota via Villavicencio from Villanueva

Source: Google Maps, 2021

The location of Villanueva is also geographically strategic due to its proximity to Yopal, 147 km away, and approximately two hours and 30 minutes away (see figure 22).

Figure 22 - Route from Villanueva to Yopal via the Troncal del Llano

Source: Google Maps, 2021

Another road connectivity route in the municipality is the Transversal del Sisga. By turning off towards Aguaclara, crossing El Secreto, the Chivor Dam, passing through San Luis de Gaceno, Garagoa, Guateque and Chocontá, it takes approximately five hours and thirty minutes to reach the capital. (See figure 23).

Figure 23 - Route from Villanueva to Bogotá via the Transversal del Sisga

Source: Concesión Transversal del Sisga, 2021

5.3.3.4 Public Utilities

The municipality has public telephone, water, sewage, electricity and household gas services. According to the Empresa de Servicios Públicos de Villanueva (ESPAVI), the water supply coverage was 99%, sewerage coverage was 97 % and the sanitation service was 100% in 2017[6].

[6] Percentage of coverage, accountability report, ESPAVI 2018.

ESPAVI is supplied by two surface water sources, whose liquid is treated with the conventional system (coagulation, flocculation, sedimentation, filtration and disinfection) through a treatment plant with a capacity of 115 lts/sec that operates 24 hours a day, 7 days a week.

In terms of coverage, ESPAVI has 6,433 registered water users in the urban area, while the rural area does not have drinking water. The number of registered users of the sewerage service amounts to 6,230 subscribers in different strata. In the rural area, water is managed by septic tanks.

The penetration of broadband internet service is 6.4% [7]and telephone coverage is 30.8%. At present there is 95.7% coverage of gas service in the urban area and 10% in the rural area, for a total coverage in the municipality of 52.85%, where the networks were built by the Governor's Office and the operation is carried out by the company CUSIANAGAS S.A. E.S.P.

The electricity service has a coverage of 98.7% in the urban area and 70% in the rural area, the total coverage in the municipality is 84.35%; this service is provided by Empresa de Energía de Casanare ENERCA S.A E.S.P; the urban networks are in relatively good condition and their maintenance is in charge of the same company. The public lighting system is administered by the Municipality of Villanueva and does not have total coverage of the urban area and the networks require maintenance. In the rural area, the network is in regular condition, which is why the service is not constant[8].

According to ESPAVI, the solid waste collection service is provided separately (organic and inorganic material) in the urban area of the municipality, with 6,166 users and 100% coverage. Collection takes place three times a week for the commercial sector and twice a week for the residential sector, collecting an average of 475 tonnes per month, which are disposed of in the municipally owned landfill.

5.3.4 Economic Component

This section describes the main economic activities and indicators of the municipality of Villanueva.

5.3.4.1 Agricultural sector

Villanueva is a purely agricultural municipality, due to the richness of its land, its water resources and the establishment of agro-industrial companies, which have boosted the municipal economy.

a. Livestock Sector

In the municipality, cattle farming is basically extensive and semi-intensive.
Most of the local production is for meat production and there is a smaller percentage of dual-purpose (meat/milk) livestock in the municipality. The municipal cattle herd for 2018 was 45,888 head, predominantly the commercial Zebu breed and crosses of this with Creole breeds to gain greater adaptability to the conditions of the area. Cattle farming has 21,200 hectares of pastures, of which 8,200 are native pastures and 13,000 are improved pastures (B. Humidicola, B. decumbens).

[7] Ministry of Information and Communication Technologies, 2019
[8] Municipal Development Plan 2020 - 2023

Photo 44 - Livestock Villanueva Municipality

Source: Fedegan, 2021

- Fish farming sector[9]

Villanueva has 70 hectares of ponds built in an artisanal way with the required technical specifications. 50 small and medium-sized producers depend on this activity. The municipality has a total of 3,160,731 fish species: Red and Black Tilapia, and Cachama; the former being more resistant to diseases and the latter more sought after in the local market. Tilapia is mostly marketed nationally with Bogotá D.C. being the main destination. Very little production remains in the local market.

The fish farmers are working with an average stocking density of five fish per square metre and the average annual production is 3000 tons. This activity is developed mainly in the villages of Leche Miel, La Comarca, La Colmena, La Libertad, El Encanto and Caracolí. This productive chain has a deficiency in infrastructure and certifications in the production process.

In the municipality there is an association of fish farmers called Asocapi with thirty-seven members. The fish farming activity creates two direct jobs and between 25 and 30 seasonal jobs for the time of slaughtering, which is paid by the day.

[9] Municipal Development Plan 2020 - 2023

Photo 45 - Fish farming activity in the municipality of Villanueva

Source: Regional Committee of the Aquaculture Chain - Department of Casanare

- Other species

In the municipality there are small and medium-sized producers of other types of livestock, such as poultry, beekeeping and pig farming, with a total of 2,807 [10]pigs in the municipality, the first two activities being carried out on a smaller scale.

b. Agricultural Sector

Most of these are crops destined for the production of food or raw materials. The most important crops in terms of areas planted are oil palm, followed by dry and irrigated rice, papaya, banana, cassava, pineapple, sugar cane, and with smaller shares, corn, soybean, citrus, watermelon, chili, passion fruit, passion fruit, soursop, avocado, guava, cashew, aloe and citronella.

- Oil palm

Palm cultivation occupies the first place in planted area and production in the municipality, as well as a high demand for employment, since it requires approximately one permanent job for every 5 to 8 hectares. Currently oil palms are planted on 19.355[11] ha approximately, with a projection of 4,900 hectares for new crops.

The municipality has companies with a long history, such as Palmar del Oriente, Luker Agrícola and Palmeras Santana: Palmar del Oriente, Luker Agrícola and Palmeras Santana have oil extraction plants which are a source of sustenance for a large percentage of the families in the municipality. In addition to these companies, there are farmers who saw in this type of crop an opportunity and became small oil palm producers, they do not have all the technology for the management and good development of the crops, but they have found in the companies a great support since they provide them with assistance and accompaniment services. The municipality also provides support to them on issues of research strategies, pest and disease management

[10] Casanare Municipal Records 2018
[11] Ibidem

and business training. These small producers carry out the marketing of their harvest to the companies present in the municipality.[12]

Photo 46 - Oil palm cultivation

Source: Fedepalma, 2021

- Rice

Within the agricultural sector, two types of rice cultivation stand out: irrigated rice and rain-fed rice, which occupy first place among the transitory crops in the municipality, and fourth place at the departmental level, with an average of 20,000 hectares[13]. In terms of labour, it employs a high percentage of workers due to the various activities involved in managing both the soil and the crop, thus generating a high economic and productive impact. Molinos Flor Huila" is present in the municipality, and is one of the main recipients of "paddy rice", i.e. the grain once it has been harvested.

Photo 47 - Rice cultivation

Source: Governorate of Casanare, 2021

[12] Municipal Development Plan 2020 - 2023 - Economic Component

[13] Agricultural base Ministry of Agriculture. 2021

- Forestry

This type of crop gained momentum in the 1980s, with the company Reforestadora de la Costa being the first to invest in eucalyptus and pine plantations[14]. Over time, farmers in the area began to plant these varieties and later also teak and acacia, but few do so for commercial purposes, as they use this production for the improvement and maintenance of their properties.

Photo 48 - Forestry Activity


Source: SCG,2021

c. Extractive sector

According to the information provided by the Table 1, on the hydrocarbon exploration blocks that have direct influence in the municipality, in all areas of oil intervention there are Corporate Social Responsibility programmes in specific places (villages and hamlets) where hydrocarbon extraction and exploitation activities are carried out.

d. Labour supply

The main sectors generating employment in the municipality of Villanueva are oil palm cultivation, the rice sector and forestry operations. It is considered that the current population of economically active age is sufficient to meet the demand for labour in the different sectors. This is explained by the migratory dynamics of the municipality, which since 1985 has attracted a national population and in recent years a foreign population (population from Venezuela) due to the employment options that are generated there.

e. Services Sector

According to the Casanare Chamber of Commerce, there are 1,214 establishments[15] serving local demand and that of municipalities such as Sabanalarga, Monterrey and Barranca de Upía, with a higher incidence of recreation and leisure establishments, personal and household stores, such as supermarkets and clothing shops, meat outlets, cafeterias and ice cream parlours.

f. Land use

[14] Municipal Development Plan 2020 - 2023 - Economic Component
[15] Casanare Chamber of Commerce, management report 2017.

Out of the total number of 9.724 properties in the municipality, 76.4% correspond to urban properties (7.438) and 23.5% to rural properties (2.286). Latifundia properties, dedicated to the exploitation of livestock and crops such as dry and irrigated rice, African palm, commercial forests and cotton, represent 44%, and smallholdings, where self-subsistence crops such as maize, cassava, beans, fruit trees, etc. are grown, represent the remaining 56%.

5.3.5 Cultural Component

- Historical and Cultural[16] Overview

The aborigines of the Casanarean plains were of the Arawac type, who were introduced to Colombia from migrations from Brazil, related to Carib Chibcha families that were located in the Casanarean foothills, whose habitat was located at the headwaters of the Arauca, Pauto, Cubogon and Tocaría rivers. The other linguistic expressions became extinct, because at the time of the conquest, Emperor Charles V ceded the exploitation of the plains to the German house of Wester in payment of some loans, and this is how the first route to the plains was created, which came from Venezuela.

In 1588, Pedro Daza founded the village of Blancos de Santiago de Atalayas in Casanare, the centre from which the encomenderos began to operate, carrying out an arduous task of culturalisation and evangelisation parallel to that carried out by the Jesuits.

In this way, the indigenous communities began the mestization and settlement of what is now the department of Casanare, including the area where many years later the Villanueva uprising began, in which remains were found such as jars made by the indigenous people and later buried, which were located in the Camarga-Lechemiel trail on the farm owned at that time by Mr. Jeremías Lara.

The birth of the Villanueva inspection took place as a result of the massive migration of personnel from the interior of the country, especially from the Tenza Valley, as a result of the political crisis generated by the death of the liberal leader Jorge Eliecer Gaitán, on April 9, 1948, when a civil war broke out between the two traditional political parties of the time, the liberal and the conservative. The Forero Romero family, composed of Campo Elías and Celina, their children Oliva, Campo Elías, Aurora, Rafael, Edilberto, Álvaro Georgina and Rosa, arrived in the village of Mata suelta, today Villanueva, on 10 December 1949. They came from the Mesa del Guavio village of Campo Hermoso Boyacá as one of the first to begin their escape to this part of the plains.

The birth of Villanueva, as a hamlet, was initially due to the need to respond to the educational needs of migrants, who arrived in different parts of the current municipal territory, but could not find educational centres either for themselves or for their children, given that the educational centres of Aguaclara, Barranca de Upía, Sabanalarga or San Luis de Gaceno were towns with schools but with very difficult access conditions, due to the distances and the poor state of the roads.

The need led them to organise themselves, so that under the leadership of Mr. Antonio Forero they drew up and signed a memorial, in order to give legal status to the hamlet and the school that were in the process of being created. As a result, Ordinance No. 21 of November 15, 1962, issued by the Departmental Assembly of Boyacá, created the Inspectorate of Villanueva,

[16] Villanueva Municipal Council

jurisdiction of San Luis de Gaceno. In 1963 the school was built and in the same year the first house was built, which, according to the design made by the members of the Junta de Acción Comunal, gave rise to the foundations of the town, starting from the same framework as the current main park of Villanueva.

In this way, Villanueva's present is marked by the impact of developments in the country as a whole and especially by the great social, economic and political conflicts in which the country was immersed from the 1930s onwards.

- Cultural Events

Table 17 - Cultural events in the municipality of Villanueva

EVENT NAME	DESCRIPTION	DATE
Summer Festival Paso San Pablo	It is held annually in the town centre of San Agustín, in the village of Las Mercedes, on the banks of the Túa River, with artistic presentations, different sporting activities such as beach football and beach volleyball championships, among others.	February
Festival of the Elderly	Cultural activities of the Elderly, among which is the Third Age Queen, is an intergenerational meeting. It is held annually	August
National Festival of Colonies	It is the most representative festival and the one that attracts most tourists to the municipality. It has been held annually since 1991 and currently brings together folkloric groups and gastronomic samples from the different regions of the country, with female and general horseback riding, a parade of typical carriages from the participating colonies, artists of national and international stature, among other activities.	August
El Garcero del Llano	It is an annual competition of dance, instruments and llanero singing between the Municipal Educational Institutions, characterised by a traditional "Joropera" through the main streets of the Municipality, it is considered cultural patrimony of the Nation.	September
Livestock Fair	It is the annual event that rescues the traditions, customs and culture of the llanera, such as the traditional horseback riding, it is developed through a wide exhibition of cattle and horses and minor species, facilitating the exchange of livestock and the strengthening of livestock farmers in the region.	November

Source: Municipality of Villanueva

Photo 49 - Cultural events

Source: Municipality of Villanueva,2021

- Monuments

- Plain Work: four characters are part of the scene; the horse, the cow and two cowboys. It is made of fibreglass and its golden appearance represents its value. It was designed from the theme of "llaneridad", due to the taste of the inhabitants for folklore and culture. It personifies the cowboys, because of their essence and feeling for work. It is located at the municipal hospital roundabout, on the Marginal de la Selva.

Photo 50 - Monumento Trabajo de Llano

Source: Municipality of Villanueva

- El Mohán: Entering the urban zone of the municipality, a human figure can be seen representing a pensive man, his hair extends down to the ground, and it is said to be one of the most ancient and has become an icon for Villanueva. It is a mystical figure representing the spirit of the waters, it has taken on the label of a monument because it was donated to the municipality. It is made of cement and is located in the park of the same name "El Mohán".
-

Photo 51 - Sculpture of the Mohan

Source: Municipality of Villanueva

- **Resilience**: built in commemoration of the victims of the armed conflict, it is made up of the figure of a butterfly, symbolising metamorphosis. Made with spare parts and elements of vehicles, the strong and striking colours make it relevant in the main park of Villanueva.

Photo 52 - Resilience Monument

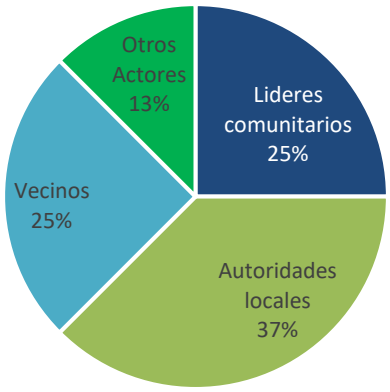
Source: Municipality of Villanueva

5.3.6 Stakeholders in the area of influence of the Refocosta operation

The following stakeholders are identified for the Villanueva forestry operation:

Graph 13 - Stakeholders identified

Source: Refocosta, 2021



- **Community leaders (13)**: this group is made up of presidents of community action boards (JAC), leaders of Asojuntas, leaders of the Afro-descendant population of the municipality of Villanueva and the Cajeto environmental organisation.
- **Local authorities (10)**: Municipal Mayor's Office, Municipal Secretariats of Social Development, Environment and Economic Development, Police Inspectorate, Environmental Inspector and Official Fire Brigade.
- **Neighbours (4)**: owners of land adjacent to the forestry operation.
- **Other actors (2)**: representative of the education sector and representative for the provision of public services.

During the field visit, this information was reviewed and confirmed. A semi-structured interview was carried out with a sample of stakeholders in order to find out the point of view of the people who have direct and indirect contact with the activities carried out by Refocosta and how they perceive the interaction of these activities with the environment and the community.

A total of ten (10) interviews were conducted, as follows:

Graph 14 - Stakeholders interviewed

Source: SCG,2021

The main results of the interviews are summarised below:

- All the actors interviewed agree that the forestry operation generates positive impacts on the socio-economic aspect and for the environment. They did not identify any negative impacts.

- They consider that all the activities of the operation have a direct influence on the generation of employment, which improves the income generation of the families and benefits the community of the municipality of Villanueva.

- They highlight the good relationship of coexistence and security that has been generated with the community throughout the time that the forestry operation has been operating in the area.

- They highlight the rigorous environmental management and environmental benefits such as carbon absorption, reduction of erosion processes and watershed protection.

- Another highlight is staff welfare, which they see as a key aspect of the company's operations through the affiliation of all employees to the health system and the provision of personal protective equipment for activities that generate some kind of risk.

5.3.7 Ethnic Communities

In order to determine the presence of ethnic communities in the area of influence of the Refocosta operation, consultations were carried out:

- National Land Agency: cartographic base of constituted indigenous reserves, resolutions of constitution of reserves, cartographic base of constituted community councils and resolutions of constitution of community councils.

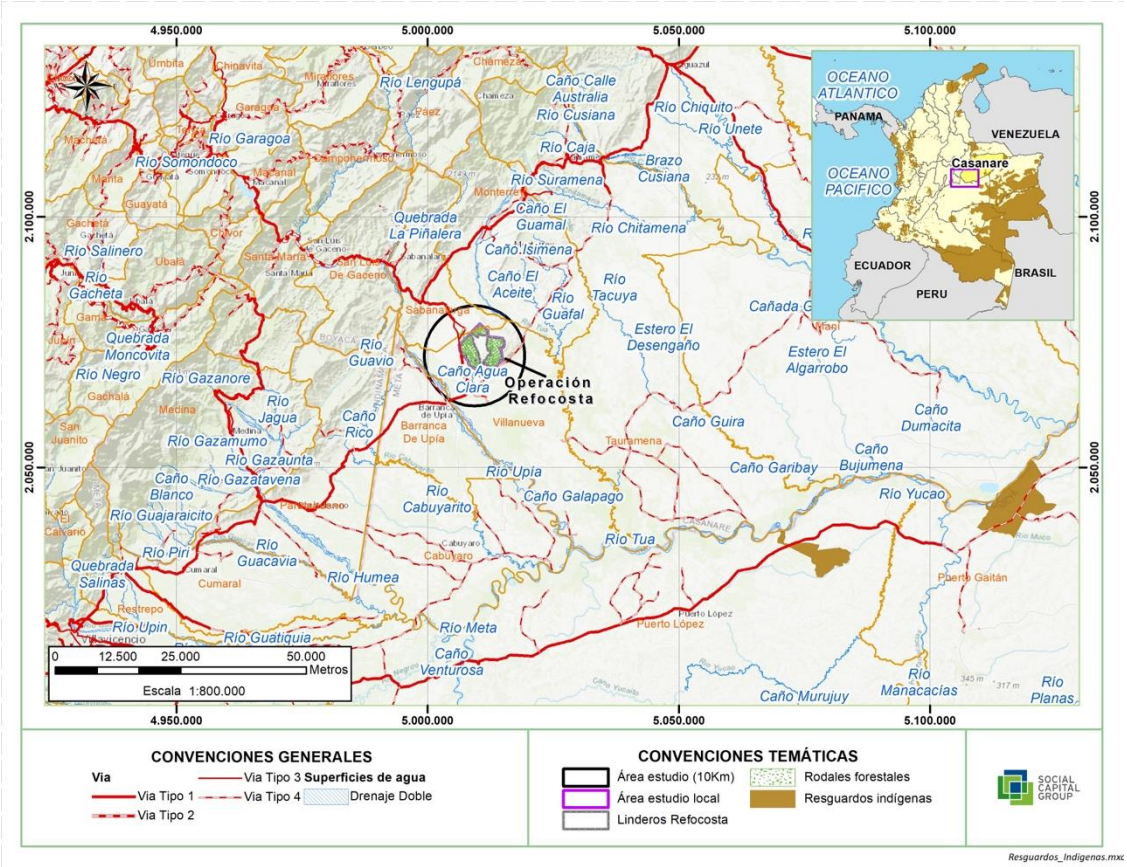
- Ministry of the Interior: database of the Directorate of Indigenous, ROM and Minority Affairs, database of the Directorate of Black, Raizal and Palenquero Communities, resolutions of inscription in the register of the Directorate of Indigenous Communities, and resolutions of inscription in the register of the Directorate of Black Communities.

- Ministry of the Interior - Directorate for Prior Consultation: database of administrative acts issued and cartographic database of administrative acts issued.

- Other secondary sources of information: registration of communities in the Ministry of Culture, Colombian Institute of Anthropology and History ICANH, Agustín Codazzi Geographic Institute and National Department of Statistics DANE.

With the geographical location of the Villanueva forestry operation, a cross-check was made with the cartographic information obtained from the sources consulted to identify the presence of ethnic communities, probable areas of settlement, uses and customs, transit and mobility, the territorial context and the possible relationships that occur in this environment. As a result, it was found that there is no coincidence between the geographical context of the Villanueva operation and the presence of ethnic communities (Figure 24).

Figure 24 - Identification of ethnic communities



Source: SCG,

5.3.8 Archaeological Component

During this phase, a review of existing primary and secondary documentation for the area of the operation and the adjacent zone is carried out. Two types of documents are reviewed: published archaeological reports (consulted directly in the ICANH library) and ethnohistorical documents. The aim of this review is to identify a general overview of the pre-Hispanic occupation of the area, define areas where archaeological finds have been made and establish a typology of archaeological sites.

For the Municipality of Villanueva only one archaeological site is identified in Barranca de Upia and this site is not within the area of influence of the forestry operation.

6 CLIMATE CHANGE

6.1 Climate change adaptation and risk management

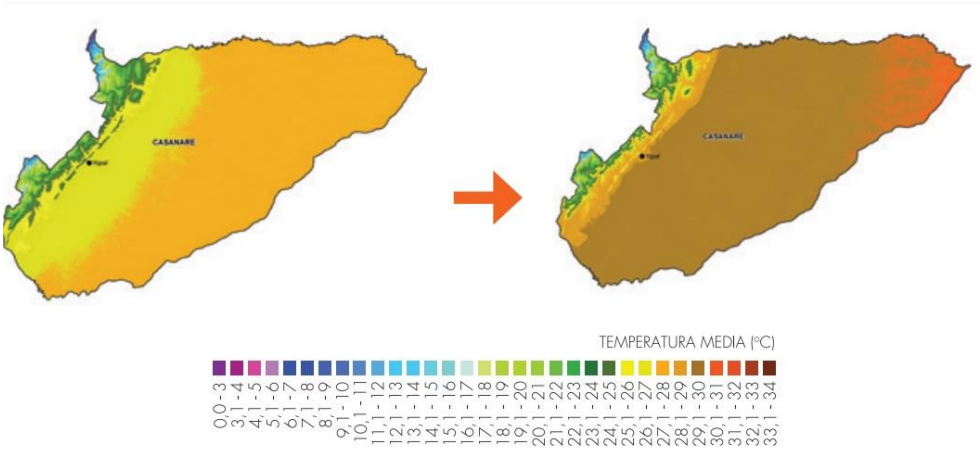
The effects of climate change are analysed from the point of view of hazards, and indirectly with the threats of flooding, forest fires and landslides. On the other hand, the effects related to the availability of water resources versus the demand required by the project in the face of drought scenarios compared to other uses and users.

According to the Third Communication on Climate Change in the document New Climate Change Scenarios for Colombia 2011 - 2100 / National - Departmental Level, Scientific Tools for Decision Making (IDEAM, MADS and UNDP, 2015), for the department of Casanare in the future (years 2071 - 2100) an increase in the average temperature of up to 2.4 ºC is expected with respect to the reference period 1976 - 2005. Even in extreme scenarios, the average temperature in this area could rise from 20°C to 29 °C (

Figure 265).

In terms of precipitation, according to the same study, a reduction in average precipitation of up to 20-30% is predicted for Casanare in 30 years, which means that in the area of influence of the project, precipitation would not exceed 6,000 mm per year, intensifying the dry seasons. Keep in mind that these are official data predicted for the entire department; there is still no specific data on the effects of climate change for the municipality of Villanueva. The main effects for Casanare can be found in the agricultural and livestock sectors, given the sustained temperature increase throughout the century. Livestock may also be affected due to the possibility of droughts. Biodiversity associated with large plains may be affected by temperature increases that prevent adaptive[17] displacement.

Figure 25 - Climate change scenarios for temperature - Department Casanare

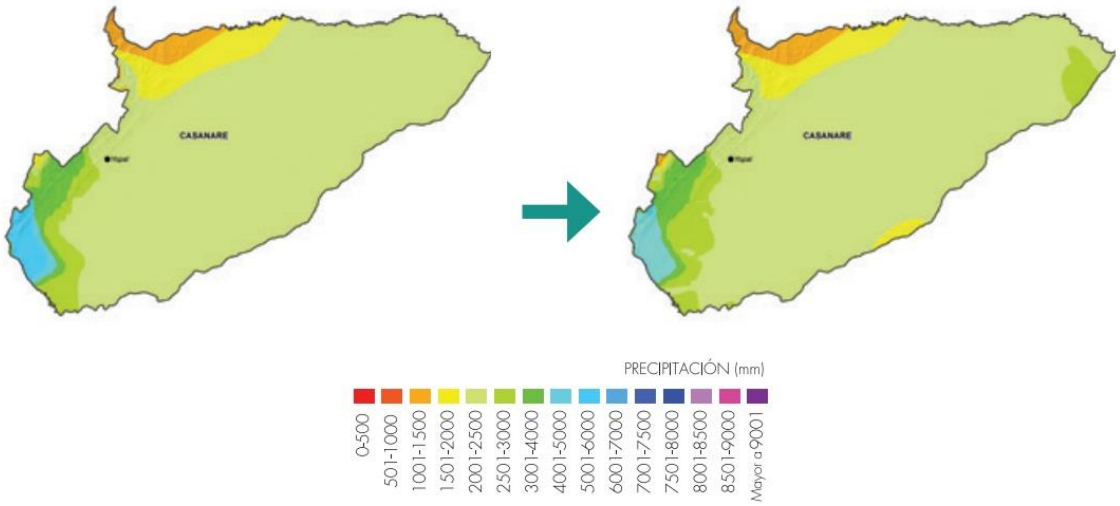


[17] IDEAM, UNDP, MADS (2015). New climate change scenarios for Colombia 2011-2100. National-Departmental Level. Scientific Tools for Decision Making. Third National Communication on Climate Change. Pp. 42. Retrieved from: http://documentacion.ideam.gov.co/openbiblio/bvirtual/022964/documento_nacional_departamental.pdf

Source: IDEAM, UNDP, MADS, DNP, CHANCELLERY, 2017.

Figure 26 - Climate change scenarios for precipitation - Department Casanare

Source: IDEAM, UNDP, MADS, DNP, CHANCELLERY, 2017.



On the other hand, according to the analysis of vulnerability and risk to climate change developed by IDEAM and UNDP (2017) built from the indices of threat, adaptive capacity and sensitivity to vulnerability and risk to climate change, for the municipality of Villanueva, the threat to climate change was defined as Low to Medium and the risk as Very Low (Table 18).

Table 18 - Climate change vulnerability analysis

MUNICIPALITY	Threat	Sensitivity	Adaptive Capacity	Vulnerability	Risk
Villanueva	0,41 Very low to low	0,27 Very low	0,67 Low to Medium	0,14 Low - Medium	0,15 Very low

Source: IDEAM, UNDP, MADS, DNP, CHANCELLERY, 2017.

In the documents provided by Refocosta, particularly in the Hazard and Vulnerability Analysis format and the Corporate Emergency Plan, there is an identification and assessment of natural hazards, such as: atmospheric, hydrological, geological, biological, and other environmental hazards such as forest fires and erosion. Disaster prevention and management measures and their corresponding Standard Operating Procedures are also in place.

Additionally, the forest fire prevention measures are included in the Monitoring Report 2019. Regarding the maintenance and conservation of firebreaks, it is taken into account that the width of the firebreaks cannot be less than 4 meters, to monitor this parameter, points are measured in the field around the perimeter in order to verify the width and trafficability of each of these reference points; The measurement resulted in an average firebreak width of 4.5 m in the Villanueva Operational Unit, which complies with the established requirements (Photo 53).

It is also detailed in this report that the maintenance and adaptation of firebreaks was carried out throughout the perimeter, with a total of 42 km mantained between November and December 2020. These firebreaks were observed in the field (Photo 54).

During 2020 the following forest fire events occurred, which were attended by the forest fire brigades led by the administrative head of the Operational Unit:

- 12/02/2020 external area in support of the community, the fire was moving in the direction of plot 58, 2.2 ha of meadow were affected, the Villanueva firefighters were supported by the unit's fire brigade.

- 17/02/2020 external area in support of the community, the fire was moving in the direction of lot 118, 0.5 of external gallery forest was affected, support was given to the Villanueva fire brigade with the unit's fire brigade.

- 19/02/2020 in lot 63, 1.6 ha of affected Caribbean Pine planted in 2006, was attended with the brigade and with the support of the Villanueva fire brigade.

In the related documents, there is no evidence of the incorporation of climate change or risk scenarios in the hazard and vulnerability analysis of extreme events related to landslide phenomena or forest fires. It should be taken into account that the increase in temperature and the reduction in precipitation aggravate the frequency and possibility of damage from these events, so it is necessary to generate preparedness and adaptation measures.

Photo 53 -Firewall barrier measurement

Photo 54 - Fire barrier

Source: Refocosta, 2020.

6.2 Climate change mitigation

In Refocosta's Sustainability Report 2020, the estimation of greenhouse gas emissions for scopes 1 and 2 is found and described as follows:

Scope 1. Includes direct emissions from activities controlled by the organisation, especially those originating from fuel consumption (diesel and petrol) of vehicles used by the organisation's members.

Scope 2. These are the indirect emissions generated by electricity production plants as a result of the entity's own consumption.

Figure 27 - Tons of CO2eq by emission source

Source: Refocosta, 2020.

In the Figure 27Figure 1 shows a reduction in CO2 emissions from the sources identified as the use of diesel, petrol and electrical energy between 2019 and 2020, and that the main source of emissions is the use of diesel. These values are for the entire organisation (Refocosta) and it was not possible to separate the specific contribution to these scopes by the Villanueva Operating Unit, neither corporate emission reduction goals, nor the action plans for 2021 to continue with the optimisation of processes that lead to a greater reduction or the achievement of the goals set by the organisation. On the other hand, the logging and wood harvesting activity also generates atmospheric emissions due to the release of CO2 contained in the biomass of the forest, however, no estimates of emissions from this source were made.

On the other hand, there is also no evidence of Refocosta's articulation with the goals of the Nationally Determined Contribution (NDC 2020) Colombia, whose national objective is to reduce national Greenhouse Gas emissions 51% by 2030; nor with the goals of the Integrated Sectoral and Territorial Climate Change Management Plans, or the adoption of the Carbon Credit System. Nevertheless, subscribing to these country strategies is voluntary, and is not subject to an environmental compliance obligation.

7 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

Environmental and social assessment is one of the main tools for the identification and evaluation of the possible impacts that may be generated by the development of project activities in an area on the physical, biotic and socio-economic components, for which management measures must be proposed in order to avoid, prevent, mitigate, correct or compensate for foreseeable impacts.

This chapter presents the assessment of the environmental and social impacts identified in the Villanueva Operating Unit and consists of a comprehensive analysis based on the specific activities to be assessed, carried out by an interdisciplinary team of professionals based on the collection and study of primary and secondary information, thus guaranteeing a detailed knowledge of the existing conditions in the area.

The methodology used is based on a qualitative assessment method, the ***Leopold Matrix***, which consists of a double-entry table in which the environmental factors that may be affected are arranged as rows and the proposed actions (activities) taking place that may cause potential impacts are arranged as columns.

It is important to clarify that this environmental and social assessment was conducted taking into account the Colombian environmental legal context, specifically related to the establishment and management of forest plantations, which according to the provisions of the Single Regulatory Decree of the Environment and Sustainable Development Sector or Decree 1076 of 26 May 2015, (which brings together in a single regulatory body Decree 2041 of 2014 that regulates environmental licensing), does not require any type of environmental license or social license both at the national level and from regional authorities, as this is not considered an activity that generates relevant impacts, both at the level of the physical environment, and at the level of the biotic and socio-economic environment.

7.1 Identification of physical-biotic impacts

Taking into account the background of the area and the conditions identified in the baseline, it was possible to establish probable effects on physical factors such as air, water, soil and landscape, biotic factors such as flora and fauna and social factors such as local economy, population, health and population, which are directly or indirectly affected by the different activities associated with the project.

According to the above, seventeen (17) impacts were established at the physical, biotic and social levels, as shown in the table below. Table 19:

Table 19 - Environmental factors and impacts - physical and biotic environment

Environment	Factor	Impact
PHYSICAL	Air	Air pollution
		Noise generation
	Water	Water quality
		Amount of water
	Soil	Soil quality
		Waste generation

Environment	Factor	Impact
		Activation of erosive processes
	Landscape	Landscape quality
BIOTIC	Flora	Vegetation cover
		Modification of natural ecosystems
	Fauna	Habitat modification
		Changes in composition
SOCIAL	Economy	Equal opportunity labour recruitment
	Gender	Acts of harassment or violence against women
	Population	Disruption because operation activities
	Infrastructure	Road safety
	Health	Risk of accidents

Source: CSG, 2021

7.2 Project activities

Taking into account the scope of the project only one stage was identified, called Operational, which refers exclusively to the management of forest plantations. From there, each of the 10 activities that comprise it were evaluated. These correspond to those described above, including everything from soil preparation to the maintenance of fences and existing access roads:

Table 20 - Potentially impacting project activities

Stage	Activity
OPERATIONAL - Management and harvesting of forest plantations	Soil preparation
	Control of unwanted species
	Fertilisation
	Planting
	Pruning
	Thinning
	Fire control
	Road maintenance
	Fence maintenance
	Ant control
	Forest harvesting
	Skidding

Source: CSG, 2021

7.3 Identification and assessment of impacts

7.3.1 Leopold Methodology

As previously mentioned, in order to have an overview of the impacts caused by the development of the operation, the Leopold Matrix was used. This matrix allows to relate various impacts on

different environmental factors to see their magnitude and importance. In turn, this does not require sophisticated means for its application, and allows a very complete vision and sweep of the project (AVELLANEDA, M. NOVOA A.B. 2017).

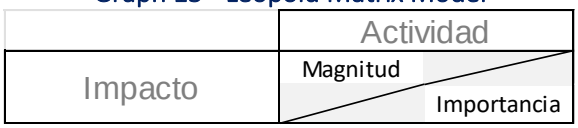
It is important to mention that the Leopold matrix does not constitute an environmental assessment system in itself, but it allows the visualisation and hierarchisation of the impacts, which generates a focused analysis of the effects that the project activities are causing on the different environments (physical - biotic and socio-economic).

This methodology was taken into account because the project has already been under implementation for a long time and, therefore, many of the impacts usually related to construction and which generate a major change in the initial conditions, have already been carried out and their effects have been incorporated into the different environments. Thus, two variables were taken into account for the rating: Magnitude and Significance. Each of these is described below:

- ✓ **Magnitude (M):** This term is used to express the extent of an impact in order to assign a valuation of the impact or the potential alteration to be caused; in this way, it seeks to reflect the degree or scale of affectation based on facts. This value is arranged in the upper left half, ranging from 1 to 5, with 1 being the smallest magnitude and five (5) being the maximum magnitude, whether positive or negative.
- ✓ **Importance (I):** A rating that gives a kind of weighting of the impact. It expresses the importance of the effect of an action on an environmental factor. This value, also ranked from 1 to 5 in order of highest importance, is written in the lower right half of the table.
- ✓ As far as possible, it is preferable that the assignment of magnitude is based on quantitative or factual information, while the assignment of importance leaves some room for the evaluator's opinion and expertise. This explicit separation of fact and opinion is an advantage of the Leopold matrix.

In accordance with the above, the ten (10) activities of the project were rated, each of these was evaluated in terms of both magnitude and Importance. Each cell (product of the intersection of rows and columns) was divided diagonally, leaving in the upper part the magnitude of the impact (M) and in the lower part the intensity of the impact (I), as shown in the following graph.

Graph 15- Leopold Matrix Model



Source: CSG, 2021

In this way, the sum of the values in the rows indicates the impact of all activities on each environmental factor or impact, while the sum of the values in the columns will give a relative assessment of the effect that each activity currently has on each of the biotic, abiotic or social factors.

It should be reiterated that, in the case of the assessment of the current project in the Villanueva Operational Area, these estimates are made in a more subjective and general manner, which is supported by both the basic information collected and the technical expertise and experience of each of the participating specialists, which included the field visit carried out and the field reconnaissance.

7.3.2 Evaluation matrix

The evaluation matrix with the factors and activities associated with the project are presented below.

Table 21 - Physical and Biotic Impact Assessment Matrix

Environment	Factor	Environmental impact	ACTIVITIES - OPERATION FOREST PLANTATIONS UOVN												Magnitude	importance
			Soil preparation	Control of unwanted species	Fertilisation	Planting	Prunning	Thinning	Fire control	Road maintenance	Fence maintenance	Ant control	Forest harvesting	Skidding		
Physic	Air	Air pollution	-1 / 1	-1 / 2	-1 / 2	3 / 4	-2 / 3	-2 / 3	-2 / 4	-3 / 4	-1 / 2	-1 / 1	-4 / 5	-1 / 2	-16	33
		Noise generation	0 / 0	0 / 0	0 / 0	3 / 4	-2 / 3	-2 / 3	0 / 0	-3 / 4	0 / 0	0 / 0	-3 / 2	-2 / 1	-9	17
	Water	Water quality	0 / 0	0 / 0	-1 / 3	0 / 0	0 / 0	0 / 0	-2 / 4	-3 / 4	0 / 0	0 / 0	0 / 0	-2 / 3	-8	14
		Amount of water	0 / 0	0 / 0	-1 / 2	-3 / 3	0 / 0	0 / 0	-4 / 3	0 / 0	0 / 0	-1 / 1	0 / 0	0 / 0	-9	9
	Soil	Soil quality	-2 / 2	0 / 0	-3 / 2	-3 / 3	0 / 0	0 / 0	-3 / 3	3 / 4	0 / 0	-2 / 2	0 / 0	-1 / 1	-11	17
		Waste generation	0 / 0	-3 / 3	-3 / 4	-2 / 3	0 / 0	0 / 0	0 / 0	0 / 0	-1 / 2	-3 / 3	-2 / 3	0 / 0	-14	18
		Activation of erosive processes	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	-2 / 2	4 / 5	0 / 0	0 / 0	-1 / 2	-2 / 3	-1	12
	Landscape	Landscape quality	-1 / 2	-1 / 2	0 / 0	3 / 2	0 / 0	0 / 0	-2 / 2	2 / 1	0 / 0	0 / 0	-3 / 3	-2 / 1	-4	13
Biotic	Flora	Vegetation cover	-2 / 3	-1 / 2	0 / 0	2 / 2	0 / 0	0 / 0	-2 / 2	0 / 0	1 / 1	0 / 0	-4 / 4	0 / 0	-6	14
		Modification of natural ecosystems	-2 / 2	-2 / 2	0 / 0	0 / 0	0 / 0	1 / 1	-2 / 2	0 / 0	1 / 3	-1 / 1	-3 / 3	0 / 0	-8	14
	Fauna	Habitat modification	-3 / 3	0 / 0	0 / 0	2 / 4	-2 / 3	-2 / 3	0 / 0	0 / 0	0 / 0	0 / 0	-3 / 3	0 / 0	-8	16
		Changes in composition	-2 / 3	0 / 0	0 / 0	-2 / 3	-2 / 3	-2 / 3	0 / 0	-3 / 2	0 / 0	-2 / 3	-2 / 2	-2 / 2	-17	21
Magnitude			-13	-8	-9	3	-8	-7	-19	-3	0	-10	-25	-12		
Importance			16	11	13	28	12	13	22	24	8	11	27	13		

Source: CSG, 2021

Table 22 - Social impact assessment matrix

Environment	Factor	Environmental impact	ACTIVITIES - OPERATION FOREST PLANTATIONS UOVN												Magnitude	Importance
			Soil preparation	Control of unwanted species	Fertilisation	Planting	Prunning	Thinning	Fire control	Road maintenance	Fence maintenance	Ant control	Forest harvesting	Skidding		
Social	Economy	Equal opportunity labour recruitment	2 / 2	2 / 2	2 / 2	2 / 2	2 / 2	2 / 2	2 / 2	2 / 2	2 / 2	2 / 2	2 / 2	2 / 2	24	24
	Gender	Acts of harassement or violence agains women	-1 / 1	-1 / 1	-1 / 1	-1 / 1	-1 / 1	-1 / 1	-1 / 1	-1 / 1	-1 / 1	-1 / 1	-1 / 1	-1 / 1	-12	12
	Population	Disruption because operation activities	-1 / 1	-1 / 1	-1 / 1	-1 / 1	-1 / 1	-1 / 1	-1 / 1	-1 / 1	-1 / 1	-1 / 1	-1 / 1	-1 / 1	-12	12
	Infrastructure	Road safety	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	-1 / 2	0 / 0	0 / 0	-1 / 2	-2	4
	Health	Risk of accidents	-1 / 1	-1 / 1	-1 / 1	-1 / 1	-1 / 1	-1 / 1	-1 / 1	-1 / 1	-1 / 1	-1 / 1	-1 / 1	-1 / 1	-12	12
Magnitude			-1	-1	-1	-1	-1	-1	-1	-1	-2	-1	-1	-2		
Importance			5	5	5	5	5	5	5	5	7	5	5	7		

Source: SCG, 2021

7.4 Environmental and social impact assessment

The matrix shows different interactions, both positive and negative, which are mainly present in the physical environment, with less intensity in the biotic and social environment. The impacts identified are presented below, ordered by their level of importance for the three environments evaluated. (Table 23):

Table 23 - Impacts assessed by importance

Impact	Importance Value
Air pollution	33
Equal opportunity labour recruitment	24
Changes in composition	21
Waste generation	18
Noise generation	17
Soil quality	17
Habitat modification	16
Water quality	14
Vegetation cover	14
Modification of natural ecosystems	14
Landscape quality	13
Activation of erosive processes	12
Acts of harassment or violence against women	12
Disruption caused by operation activities	12
Risk of accidents	12
Amount of water	9
Road safety	4
Grand total	**262**

Source: CSG, 2021

Based on these results, it is evident that the four (4) most relevant impacts are the following:

- Air pollution (-16/33): All activities have the potential to generate air pollutants (particulate matter and gases) to the extent that they use equipment that requires fuel or involve the use of roads for transport from one point to another. The activities that can generate the greatest amount of emissions are road maintenance, skidding and thinning.

- Equal opportunity labour recruitment (24/24): this is a positive impact, all activities of the operation have the potential to generate employment for the population in the project's area of influence.

- Changes in the composition of fauna (-17/21): In the development of the operation of the project, the activities of: Land preparation; Control of unwanted species; Pruning; Thinning, Road maintenance, forest harvesting and ant control, are the activities that involve changes in the composition of wildlife species.

- Waste generation (-14/18). Hazardous and special waste is generated. These are generated by activities such as fertilisation, control of unwanted species and ant control; other types of usable or ordinary waste are obtained from fence maintenance activities.

The following is a description of the impacts with the greatest magnitude and intensity after adding up the rows, i.e. the description of the environmental factors that will be most affected by the implementation of this project.

7.5 Impact assessment by environmental factors

- Air pollution

This factor has a rating of **-16 in magnitude and 33 in importance**. All activities have the potential to generate air pollutants (particulate matter and gases) to the extent that they use fuel-powered equipment or involve the use of roads for transport from one point to another. The activities that can generate the greatest amount of emissions are road maintenance, as this requires heavy diesel-powered machinery, as well as forestry, due to the CO2 accumulated in the biomass that is released at the time of felling and the machinery needed to carry out this activity.

As these impacting activities are of a one-off nature and carried out in defined periods, they will not generate a change in the current air quality condition of the area.

The impact on air quality will also be positive in this project, as the new plantations play an important role in improving air quality by absorbing CO2 and acting as a natural barrier to particulate matter and noise emissions, which is why it has been assessed as positive in this case.

- Noise generation

This factor received a rating of **-9 in magnitude and 17 in importance**. As in the case of air quality, the use of machinery and tools for road maintenance, skidding, forest harvesting and to a lesser extent for thinning will generate noise. The plantation generates a positive impact as it acts as an attenuator of sound.

From the occupational point of view, it will be necessary to take protective measures for workers. These works are carried out in specific areas, intermittently, and far from populated centres, and for this reason noise levels will increase on an ad hoc basis, not generating a change in the current condition.

- Water quality

Water quality could be affected mainly by the contribution of pesticides, chemical and biological nutrients from fertilisers to the plantations, as well as sediments, which can be carried by rainfall and runoff into the water bodies present in the area of influence. The activities that can generate this impact are fertilisation, fire control (through the construction and maintenance of firebreaks) and road maintenance and skidding.

It should be taken into account that the micro-watersheds of the Los Mangos, Agua Clara and Huerta La Grande streams are of great importance for the municipality as they supply drinking water. However, in the field a good state of conservation and appearance of the water was evidenced, so it is expected that the change of this element is not relevant, for this reason it has been evaluated with a **magnitude of -8 and importance of 14**.

- Quantity of water

In the Villanueva Operational Unit, water is collected from a spring at the height of the Huerta La Grande stream, and is used for domestic activities (sanitary units, showers) and industrial use, including fertiliser and pesticide preparation, and washing of machinery and tools. Its magnitude has been qualified as one of the lowest considering that water consumption is controlled and in small quantities, since irrigation is not carried out continuously, but only in nurseries and clonal gardens. During the growth of the plantation of stands, the rainy season is taken advantage of.

Another relevant activity that consumes water, but in a sporadic and circumstantial way, has to do with fire control. In the event of a fire, the Villanueva Operational Unit has mobile fire-fighting units.

For this reason this impact has been assessed with a **magnitude of -9 and importance of 9,** as a result of rating it for fertilisation, planting, fire control and ant control activities.

- Soil quality

Soil quality could be affected mainly by the misuse or poor maintenance of machinery and tools, and their corresponding inputs. Additionally, land preparation, fertilisation, planting, fire control and ant control can lead to changes in the texture and structure of the soil, including its chemistry and microbiota. It should be borne in mind that these soils are poorly drained and tend to be acidic and infertile, making them sensitive.

There may be spills or leaks of fuels, oils or greases that may affect soil components. In addition, good waste management must be taken into consideration in all project activities, as poor storage and disposal could alter soil quality.

Another important factor to take into account is that the maintenance of roads oriented to points of laminar erosion and in gullies, generates a positive impact on this element. This impact has been assessed with a **magnitude of -11 and importance of 17**.

- Waste generation

This impact is present in all project activities and has been assessed with a **magnitude of -14 and importance of 18**.

Hazardous and special waste is generated by activities such as fertilisation, control of ants and unwanted species, as well as the use and maintenance of motorised tools, vehicles and machinery that are necessary for plantation and forest harvesting activities; other types of usable or ordinary waste are obtained from the maintenance of fences and plantations. The waste must be temporarily stored according to its condition in suitable places for subsequent disposal in controlled sites.

- Activation of erosive processes

This impact is related to the appearance of erosion: laminar, by water drops or gullies. As identified in the socio-environmental characterisation, two erosion points were identified during the field trip, and according to the periodic monitoring carried out by Refocosta, 32 points have been identified and controlled.

It is considered that the activity that can enhance its occurrence is fire control, as it involves stripping the soil of its topsoil and generating its movement, forming firebreaks and guardrails that leave it exposed to rain and wind. For this reason, the road maintenance activity generates a positive impact as it corrects this phenomenon, however, it also implies its occurrence in the event that the cuts are not carried out properly or maintenance is not performed at the required frequency. For this reason, this impact obtained a **magnitude rating of -1 and an importance rating of 12.**

- Landscape quality.

The evaluation of this component was **magnitude rating of -4 and importance rating of 13.** The plantations improves visual contrasts by adding shades of green, which represent a gain in terms of quality, compared to bare soil or even only herbaceous vegetation. However, during land preparation activities, there is a temporary impact on this component as it is necessary to remove existing vegetation in the case of new planting sites, which generates an undesirable visual composition. In addition, during the control of undesirable species, negative impacts are also generated, as the richness of colours provided by the different species of herbaceous and aboreal plants that grow next to the plantations is reduced. On the other hand, the actions carried out to control fires generate losses of vegetation cover and geometric patterns of straight lines that diminish the visual quality of the landscape, although this impact has a moderate to low magnitude.

7.5.1 Biotic Environment

- Vegetation cover

This component was assessed with **magnitude rating of -6 and importance rating of -14**. Overall, the operation affects vegetation cover negatively, although this is of a slight magnitude and moderate to low importance. The greatest impact is generated during land preparation, especially when plantations are to be established for the first time, as the associated vegetation cover must be partially removed. Positive effects are also generated during the planting stage, as new vegetation is established which, although not native, plays a role in soil protection and regulation of the hydrological cycle. Finally, during the process of fence maintenance, a positive impact is generated, especially on the areas of protective vegetation, as it prevents the presence of people and/or grazing animals in these areas, thus maintaining the natural regeneration processes and consolidating the structure of the gallery forests.

- Modification of natural ecosystems

This component was evaluated with **magnitude rating of -8 and importance rating of 14**. During the implementation of project activities, there is a negative alteration, classified as low magnitude and moderate to low importance, which occurs in activities such as land preparation and control of unwanted species. This is due to the fact that with these activities there is a loss in the diversity of flora associated with natural ecosystems, as individuals of species are removed which, although undesirable, are part of the ecosystemic balance.

- Habitat modification

This component was assessed with **magnitude rating of -8 and importance rating of 16.** In Land preparation for habitat modification (-3/3), the magnitude is negative because vegetation is removed that is considered "undesirable" for future planting, in this activity vegetation such as

small shrubs or clumps of grasses are removed, these at the time of removal may be offering resources (food, shelter) to for example some species of seed-eating, fruit-eating and nectar-eating birds.

In the case of planting (2/4), the magnitude is positive in that planting trees, whatever the species, promotes new habitats for wildlife. Pruning and thinning (-2/3), have the same low negative magnitude, basically generating a one-off loss of habitat, for example, a nest in a pruned branch or in a thinned tree.

In the activities of land preparation, planting, pruning and thinning, for the four activities the magnitude is low and the importance is also low, in this case the changes in the composition of the fauna are inherent to the modification of habitats, when a habitat is modified, the change that occurs segregates some species, but opens the possibility for others to take advantage of the new habitat. This is how the loss of habitat in tree cover leads to the displacement of arboreal species, but also opens up the possibility for other species more associated with open areas to take advantage of this new condition, which is reflected in a compositional change of species in the different faunal groups.

According to the field visits, it was observed that in general, there is no or very little natural regeneration of pine or eucalyptus species within the conservation areas, as native species generally predominate. On the contrary, there is a tendency for part of the natural vegetation to rapidly colonise the plantation areas that are left "at rest" after their use. For this reason, no negative impacts on seed dispersal in natural areas are considered.

Finally, in the logging activity, which basically consists of felling trees, the magnitude and importance of the impact of habitat modification is considered moderate (-3/3). The change basically consists of the loss of a substrate (habitat), represented by trees or a group of trees, which affects species that depend on or are associated with this habitat, but, just as this means a loss for some species, it means a gain for others, which have the possibility of colonising these new functional spaces.

- Changes in composition

  In the activities of land preparation, planting, pruning and thinning (-2/3), it is inherent that the modification of the habitat leads to compositional changes in the fauna, when a habitat is modified, the change that occurs tends to segregate some species, but opens up the possibility for other species to use the new habitat. This is how the loss of habitat with tree cover leads to the displacement of arboreal species, but also to other species associated with open areas colonising these spaces, which is reflected in a compositional change in the species composition of the different faunal groups.

  The impact of the change in species composition generated by the logging activity is considered to be of low magnitude and importance (-2/2). It is important to point out that fauna as such is a dynamic component that generally goes in search of the resource and spaces to carry out its vital functions, therefore, the aforementioned changes in composition may be very temporary and minor. Those that depend on trees for their permanence (arboreal) quickly move to sites that offer very similar conditions, but other species also take advantage of the new spaces, thanks to the fact that they are generalist, opportunistic or "tolerant" species to the new conditions imposed in the environment.

  In the activities of: Road maintenance (-3/2), the magnitude is medium and the importance is low, and in the activity of skidding it is considered of low magnitude and importance (-2/2).

These activities can generate very occasional and few compositional changes due to the loss of individuals, in the maintenance or operation of transport routes, machinery and vehicles are used that can run over individuals of wild fauna, these accidents may be very sporadic, but have a high influence when the running over happens to pregnant mothers or juvenile individuals.

In the ant control activity (-2/3), it generates the loss of a resource for some species of fauna, in this case the changes in the composition are caused by the displacement of species that use the affected resource, for example: The anteaters *Myrmecophaga tridactyla* and *Tamandua tetradactyla*, are insectivores and voracious consumers of ants, when carrying out the ant control activity for obvious reasons of defence of the plantation, part of the food resource for these two species is eliminated, which leads to these being redirected to other sectors, thus reducing the abundance and altering the composition of species in situ. It is unlikely but necessary to consider that when spraying is carried out, whether for ant control or other types of control, some insects may be consumed by insectivorous species, eventually causing poisoning and probably death.

7.6 Impact assessment by project activities

According to the interactions evaluated for each of the project activities, it is evident that those of greatest importance correspond to planting (15.14%) and forest harvesting (14.59%). Other activities that generate significant impacts are road maintenance, fire control and land preparation. (Graph 16).

Graph 16 - Distribution of activities by importance of impacts

Source: CSG, 2021

A detailed description of these activities is presented below.

- Plantation

For this activity a value of **magnitude 3** was established, and **28 in importance**. During this activity, some of the most relevant impacts, both positive and negative, are being considered, so that, at the end of the qualification, a positive magnitude is presented, as the environmental benefits of this activity are of greater magnitude. Specifically, according to the assessment, the negative impacts include waste generation and soil quality. On the other hand, the positive impacts include the quality of the landscape and the modification of habitats, given that the trees provide shade, humidity and chromatic diversity, among others, which contribute to improving the general structure of the area.

- Forest harvesting

This activity has a **magnitude value of -25 and importance of 27**, as with the process of felling each of the trees within each lot, the soil is left without forest cover for a period of time, while the planting process is carried out. This implies that there are changes in the habitat for some species, as well as in the landscape, among others. In addition, the activity generates noise and emissions due to the use of chainsaws.

- Road maintenance

For this activity a **magnitude value of -3 and importance of 24** were determined. This activity generates air and noise pollution, mainly due to the operation of machinery required to level roads, transport materials and so on. However, this is of a temporary and periodic nature. Among the positive impacts, soil stability stands out, as the reconformation of the road and drainage areas prevents the generation of erosive processes, ensuring that water flows properly without causing damage to this resource.

- Fire Control

This activity has a **magnitude** value corresponding to **-19 and 15 for importance.** This activity interacts with almost all environmental factors, as the opening and maintenance of vegetation-free strips generates different impacts that contribute both to the generation of pollution and to the reduction in the quality and quantity of water, also affecting the stability of the soils, which can remain without vegetation cover or with a vegetation cover of creeping herbaceous plants, which does not allow the improvement of the physical and chemical conditions of this resource.

7.7 Impact assessment for social factors

In this section, the social impact assessment is presented. It then identifies which impacts are of greatest importance and magnitude by Project activity. For each impact, an explanatory analysis is provided.

- Equal opportunity labour recruitment

This impact has a **magnitude rating of 24 and importance rating of 24.** This activity promotes the generation of local employment, it is considered residual when the workforce is brought from municipalities other than the one corresponding to the area of influence of the operation, in which case it is established as a resident population, a fact that will be controlled mainly by hiring local labour. It is not estimated that a significant number of workers will be hired, taking into account that the vast majority of the required worker profiles are already contracted. Women and men will be able to have equal access, develop their full potential and benefit from their efforts according to their skills and merits.

- Acts of harassment or violence against women

This impact has a rating of **-12 in magnitude and 12 in importance**. The operation employs a greater number of male workers, considering the physical requirements of some activities, this fact could increase the rates of sexual harassment and/or violence against women in the community of the area of influence, towards women workers of the company, contractors and/or subcontractors.

- Disruption of operation activities

This impact has a rating of **-12 in magnitude and 12 in importance.** The nuisance caused by the activities of the operation that can generate noise, dust and pollution from passing vehicles in the population of the area of influence is a social repercussion of the environmental impact on the level of noise and air quality.

- Road Safety

This impact is rated **-2 in magnitude and 4 in importance.** When material or machinery mobilisation activities are carried out, accidents may occur in the areas surrounding the operation, due to speeding of vehicles associated with the operation or of the population, lack of skill of drivers or sudden acts.

- Risk of accidents

This impact has a rating of **-12 in magnitude and 12 in importance.** Damage to the operation of machinery and/or equipment, electrical storms, fuel and/or chemical spills, threats of forest fires, high temperatures and/or threats of flooding, as well as the risks inherent to each work activity in the operation stage can be generated.

8 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The main objective of the ESMP is to establish the general guidelines that allow the adequate control of the components of the abiotic, biotic, socioeconomic and cultural environment, during the activities associated with the current operation related to the forest plantations present in the Villanueva operational area, which are related to silvicultural aspects such as land preparation, planting, pruning and thinning, as well as other support activities such as road maintenance and fire prevention.

The structure of the EMP, which is the subject of this document, establishes the environmental management programmes for each of the means that must be implemented or continue to be managed for the development of the activities associated with this project, on the understanding that these are aligned with those already existing in the management plan for this area according to the documents supplied by Refocosta.

In this sense, each sheet of this programme contemplates the scope, objectives and actions to be developed and the proposed goals. It also establishes those responsible for their execution. The aim is to clearly identify and/or validate the purpose to be achieved through the implementation of programmes and activities designed to prevent, mitigate, correct and/or compensate the possible environmental impacts identified in this operation.

8.1 Physical environment

The following are the management measures established for this environment, which seek to prevent, control and mitigate the environmental impacts of the physical environment that were rated as being of greater magnitude and importance:

8.1.1 Integrated solid waste management

8.1.1.1 Outreach

The Integrated Solid Waste Management Programme is aimed at the development of activities in Refocosta's work centres, and must be complied with by employees, clients and visitors. The aim is to reduce pressure on the municipal landfill through the management of electrical and electronic waste, usable waste, non-usable waste, biodegradable waste and hazardous waste.

8.1.1.2 Objectives

Prevent and control the environmental impacts generated by the Organisation in relation to the generation of solid waste.

✓ Properly dispose of usable, non-usable, biodegradable and hazardous waste generated by the organisation.

8.1.1.3 Targets

✓ Properly dispose of 100% of the hazardous waste generated.

✓ Proper management of 100% of the solid waste generated.

✓ Train 100% of staff in integrated solid waste management.

8.1.1.4 Actions

- Source separation

The waste generated in the development of the activities will be classified and separated according to the colour code established in Resolution 2184 of 2019, which amends Resolution 668 of 2016 on the rational use of plastic bags and other provisions are adopted, in order to select and store them in containers (ecological points) to facilitate their subsequent management.

Each work station or work front shall have an ecological point made up of duly labelled coloured bins for the storage of each type of waste generated. If sharps waste is generated, it shall be deposited in properly labelled containers to prevent accidents due to biological risk.

Figure 28 - Colour code for waste classification

Source: Resolution 2184 of 2019.

- Generation and initial disposal

The initial disposal of waste will be carried out in containers covered with plastic bags of the same type, intended for the segregation, collection and storage of waste while it is transferred to the temporary solid waste collection centre when available. In order to ensure optimal waste management, each container must be fully identified according to the colour code defined in Resolution 2184 of 2019 (Figure 28). Hazardous waste shall be deposited in red bags or bins.

The ecological points are located under a roof to provide protection from rainwater, and each bin has plastic bags of the same colour. When required, bags are changed at the ecological points, replacing them with new ones and taking the used ones full of waste to the temporary solid waste collection point, where they will be weighed and delivered to the external waste manager.

- Collection

The residence time of waste at generation sites should be as short as possible, especially in areas where hazardous waste is generated. The frequency of internal collection depends on the storage capacity and the type of waste regenerated. In the case of hazardous waste, storage should not exceed 12 months, according to decree 4741 of 2005.

- Temporary storage

The temporary storage of solid waste must be in an appropriate place and destined only for this use. For this purpose, an area should be prepared with its respective separation cells duly waterproofed, where hazardous, ordinary and recyclable waste can be easily separated. It should have at least:

- Rainwater protection cover.
- Adequate ventilation.
- Smooth, easy-to-clean walls, hard, washable floors with a slight slope to the interior. o Fire extinguishing equipment.
- Signage to indicate the type of waste going into the area.
- Signage for mandatory use of PPE.
- Signage with warning symbols according to the type of hazardous waste stored.

The storage site for hazardous and non-usable waste shall maintain orderly and clean conditions and ensure that spillage or leakage directly onto the ground is prevented (and).

Photo 55 - Hazardous waste storage site

Photo 56 - Storage site for non-usable waste

Source: SCG, 2021, based on information collected in the field.

- Delivery to waste management companies

The waste generated must be delivered for treatment and/or final disposal to management companies that have the necessary environmental permits for their operation. The management companies shall be defined according to availability at the workplace.

On the other hand, packaging and containers of chemicals, fertilisers and pesticides will be returned to the supplier in a reverse logistics scheme, or be disposed of as hazardous waste.

- Treatment and/or disposal

The treatment and/or final disposal will be the responsibility of the management companies, who, depending on its typology and origin, will apply the most appropriate methodology, generating a certificate of final disposal or use in the name of the Organisation. In the case of organic waste or biomass from pruning, thinning, control of unwanted species, among other related activities, the treatment and final disposal will consist of organic degradation in the same site of the plantation, composting or use of the wood for the manufacture of fences.

- Control of solid waste generation

A record of waste generation will be kept through the implementation of the format (Control of waste generation), which must be filled in at least weekly, and the format (Delivery of waste), which will be implemented in each delivery to the different management companies.

- Training on integrated solid waste management

Training and awareness-raising campaigns on the proper management and disposal of solid waste will be conducted.

8.1.1.5 Responsible

The sustainability management is in charge of making the necessary agreements with the management companies for the adequate final disposal of solid waste, as well as guiding and executing the training process for employees, and monitoring the integrated management of solid waste in the work centres.

The administrative head of the Villanueva Operational Unit must manage the delivery of the waste for final disposal; request the final disposal certificates from the waste management companies; and must keep documentary control of the records generated by the implementation of the integrated solid waste management programme.

8.1.2 Water use efficiency and quality

8.1.2.1 Outreach

The Efficient Water Use Programme is aimed at the development of activities in Refocosta S.A.S. work centres, and must be complied with by employees, customers and visitors, in order to promote a culture of saving water resources. It is oriented to prevent the reduction and affectation of water resources.

8.1.2.2 Objectives

✓ Prevent waste of water resources during the execution of activities.
✓ Monitor water quality in micro-watersheds to prevent water resource quality from being affected during the execution of activities.

8.1.2.3 Targets

✓ Ensure efficient use of water in workplaces.
✓ Train 100% of staff on issues related to water saving and efficient use of water, and pollution prevention.

8.1.2.4 Actions

- Training on water use efficiency and water saving methodologies

The efficient water use programme includes talks and training to raise awareness and educate staff to adopt environmentally friendly lifestyles through the saving and efficient use of water. Training in efficient water use will be carried out in conjunction with the environmental education programme.

- Publication and dissemination of information

Communication pieces will be published in order to disseminate relevant information on the importance of the proper use of water resources.

- Maintenance of the hydraulic network components of the installations and the discharge management system.

Preventive and corrective maintenance activities of the hydraulic components and networks of the installations include:

- Periodic inspections for leaks and damage to septic tanks and other components of the domestic waste management system, pipes, tanks, pumps and fittings of the hydraulic networks of the facilities.
- Priority management of corrective maintenance of the hydraulic components and networks of the installations.
- Perform maintenance and calibration, at least once a year, to surface water concession drinking water inlet flow meters.

- Report drips or leaks

Training and awareness campaigns will be conducted on the proper handling and disposal of solid waste. All employees and contractors shall report any water dripping or leaking, so that appropriate action can be taken to prevent water wastage.

- Measuring water consumption.

Where possible, a record of water consumption will be kept at work centres through the implementation of the formats (Control of water consumption) and periodic reporting to Sustainability Management through the online tool for measuring the Water Footprint.

- Measuring water quality

At the catchment point of the Villanueva Operational Unit of the Aguas Claras stream, water quality measurements shall be taken at least once a year for parameters such as nitrates, oxygen content, coliform content, pH, total suspended solids, BOD, fats and oils, according to the guidelines of Resolution 631 of 2015 Article 8. These results shall be systematised and analysed to identify possible deviations and generate action plans. Laboratory analysis and sampling shall be carried out by accredited laboratories.

- Spill prevention

While project activities may have a negligible impact on water quality and availability, there may be contingencies related to spills of fuels, oils, chemicals and other hazardous liquid inputs. To this end, the storage of these substances will have a spill and contingency containment system for the storage tank, as well as a system for collecting minor spills at the dispenser site, by means of a floor plate and sumps, with a fuel-water separator, to prevent fuel discharges into the environment. With regard to industrial supplies, safety tanks will be implemented for their containment, sumps and dikes, so that in the event of a contingency it will be possible to prevent them from leaking into the subsoil.

8.1.2.5 Responsible

The sustainability management is in charge of guiding and executing the training process for employees, as well as monitoring the fulfilment of the programme's objectives and goals.
The administrative head of the Villanueva Operational Unit shall implement the actions of the water efficiency programme in the workplaces.

8.1.3 Efficient energy consumption

8.1.3.1 Outreach

The Efficient Energy Consumption Programme is aimed at the development of activities in Refocosta S.A.S. work centres, and must be complied with by employees, customers and visitors, in order to promote a culture of energy efficiency. It seeks to reduce the pressure on natural resources generated by the consumption of fossil fuels and electricity generation.

8.1.3.2 Objectives

✓ Ensure efficient energy consumption during the execution of activities.

8.1.3.3 Targets

✓ Ensure efficient energy consumption in workplaces.

✓ Train 100% of staff on energy saving and energy efficiency issues.

8.1.3.4 Actions

- Training on energy efficiency methodologies

The energy efficiency programme includes talks and training to raise awareness and educate staff to adopt environmentally friendly lifestyles by saving energy. Training on efficient energy consumption will be carried out in conjunction with the environmental education programme.

- Publication and dissemination of information

Communication pieces will be published in order to disseminate relevant information on the importance of efficient energy consumption.

Use of energy-saving appliances and equipment and LED bulbs. If possible, it is recommended to purchase energy-saving appliances and equipment for the activities to be carried out within the project. Also ensure that the lighting supplied is LED, as they are more energy efficient than other types of bulbs.

- Exploitation of natural light and use of renewable energy sources

In workplaces where natural light is sufficient and comfortable, it is recommended to turn off artificial lights, contributing to energy savings. Moreover, Refocosta shall identify opportunities for the use of renewable energy sources (solar panels, wind turbines, biofuels) and their involvement in its operational processes.

- Maintenance of electrical networks and equipment

Preventive and corrective maintenance activities for electrical networks and facility equipment include:
o Periodic inspections for inefficient use of electrical networks and facility equipment.
o Scheduling periodic preventive maintenance of electrical networks and equipment to ensure efficient use of energy.
o Priority management of corrective maintenance of electrical networks and facility equipment.

- Measuring energy consumption

Where possible, energy consumption will be tracked through the implementation of the Energy Consumption Monitoring form, and regular reporting to Sustainability Management through the online Carbon Footprint measurement tool.

8.1.3.5 Responsible

The sustainability management is in charge of guiding and executing the training process for employees, as well as monitoring the fulfilment of the programme's objectives and goals.
The administrative head of the Villanueva Operational Unit shall manage the delivery of waste for final disposal and shall monitor the efficient use of energy in the workplaces.

8.1.4 Handling of chemicals, fuels, fertilisers and pesticides

8.1.4.1 Outreach

The Programme for the management of chemical substances, fertilisers and pesticides is aimed at the development of activities in Refocosta S.A.S. work centres, and must be complied with by collaborators, clients and visitors. It is aimed at preventing spills of these substances or contingencies, and not affecting the quality of the soil.

8.1.4.2 Objectives

✓ Prevent spills of chemicals and/or fuels on the ground.

✓ Prevent soil and water bodies from being affected by the proper use of chemicals and fuels.

8.1.4.3 Targets

Ensure proper handling of chemicals, in their storage, transport and use as fertilisers or pesticides (ant control), as well as in their final disposal.

✓ Train 100% of staff on issues related to the proper handling of chemicals.

8.1.4.4 Actions

- Training on proper handling of chemicals, fuels, fertilisers and pesticides.

Training should cover the risks and controls in the handling of these substances to prevent health effects on workers and the environment; identification of the Globally Harmonised System for labelling chemicals and identification of hazards.

The emergency brigade must have specific training on how to deal with chemical and fuel spills, as well as materials for spill control (absorbent material, shovel), measures for the recovery of soil affected by spills and the management of hazardous waste resulting from the contingency. In addition, the roles and responsibilities of the response team, the mechanisms for emergency evaluation and activation of attention, and emergency reporting established in Refocosta's Emergency Prevention, Preparedness and Response Plan must be followed.

- Application of fertilisers and pesticides.

The application of fertilisers and pesticides must be carried out strictly according to the measures and doses technically established by Refocosta, which guarantee that the soil and the plantation are not affected.

In order to optimise the use of agrochemicals, especially pesticides, the following activities are recommended for maintenance, historical reduction of quantities used or substitution by more environmentally friendly active ingredients:

- Registration of product extension.
- Recording of product consumption.
- As far as possible, the management of minimum inventories of products in stock.
- Application in compliance with ICA approved recommendations for use as described on the label.
- Maintenance of application-related equipment.
- Review of application rates.
- Testing of products with more environmentally friendly active ingredients.

- Road maintenance measures

For forest road opening or road maintenance activities, preference shall be given to using existing roads, where they exist, in order to cause as little damage to the soil as possible. Machinery and equipment should only travel on marked roads. The parking of machinery and vehicles will only take place in the place designated for this purpose, which will be waterproofed, so that in the event of spills or leaks the hydrocarbon does not penetrate the ground.

A preventive and periodic review of all machinery and equipment to be used in the project will be carried out in order to identify any type of leakage or spillage that may affect the soil.

- Reception and storage of chemicals

The handling of chemicals and fuels must be carried out in a safe manner during their reception. During unloading, damage to chemical containers and spillage of chemicals must be prevented. Verify compliance with Decree 1079 of 2015, on the transport of hazardous substances, according to the following criteria:

- Identification of the hazardousness of substances transported by the vehicle and compliance with the standard.
- Safety measures such as fire extinguishers, first aid kit, torch, spill kit, communication device and personal protective equipment.
- Compulsory accident insurance, technical-mechanical and pollutant emissions inspection and valid driver's license.
- Transport conditions of the cargo: packaging, stacking, securing, etc.
- Contingency plan in case of emergency, list of telephone numbers, safety sheets and emergency cards.
- Driver training in the transport of dangerous goods.

- Tagging

Ensure that chemicals received from the supplier have hazard identification according to the internationally standardised Globally Harmonised System of Hazard Communication. In addition, this identification must be in good condition, must correspond to the chemical and the instructions must be legible. Preferably they should arrive in Spanish language, otherwise it must be guaranteed that the supplier provides the SDS in Spanish language.

Containers must be received properly sealed and packed, with no chemical spillage or serious damage to the structure of the container. If applicable, containers must be delivered with a lid and the tap must be in proper working order.

In the event that a chemical container is identified as not having hazard markings, the supplier should be requested to install these, clearly and in accordance with the Globally Harmonised System.

All containers stored inside the facilities must have a label in a visible place. If the label does not come from the supplier, the respective label with the aforementioned information must be attached during the reception procedure of the product.

- Compatibility

Chemicals should be stored taking into account their compatibility and the risks that may be generated by possible spills. The compatibility of chemicals to be stored should be verified in the Compatibility Matrix located in the chemical stores.

Photo 57 - Chemical storage site

Photo 58 - Fertiliser and pesticide storage site in clonal garden

Source: SCG, 2021, based on information collected in the field.

In all cases, the MSDSs of the substances should be consulted to identify the hazards to be compared in the Matrix. Some notes may also be provided for the yellow convention, which are presented below:

Table 24 - Chemical Compatibility Matrix Conventions

Convention	Meaning	Description
	Incompatible substances	Chemicals should be stored separately. Separate warehouses.
	Caution possible restrictions	Check individual incompatibilities in the Material Safety Data Sheets of the substances. May be incompatible or have specific storage conditions.
	Can be stored together	Check reactivity on the Material Safety Data Sheet.

Chemical storage sites must comply with the following conditions:

- The storage area should be restricted access, ventilated and naturally lit, but protected from direct sunlight and its walls should be dry.
- It must be equipped with fire extinguishers chosen according to the characteristics of the products being stored and absorbent material kits to deal with leaks or spills.
- It must be located away from places where sparks, fire, electrical power cuts, etc. can be generated.
- Tidiness and cleanliness must be ensured at all times.
- Safety data sheets should be kept close to the storage room.

- Handling of chemicals

Chemicals should only be handled by trained personnel. Recognise the product label before handling or storing. For new chemicals it is recommended to familiarise yourself with the labelling during initial handling.
Carry out the transfer in safe conditions (by using the necessary auxiliary equipment, personal protective equipment applicable according to risk, earth clamps in the case of flammables, etc.). Transfer at slow speeds, avoiding splashes and projections, avoiding free pouring from containers.

Transfer in well-ventilated areas, preferably by localised extraction. Keep containers closed when not in use, close them at the end of the operation and make sure they are clean on the outside.

Use protective equipment as specified in the safety data sheets, for those operations that require it.

8.1.4.5 Responsible

The sustainability management is in charge of guiding and executing the training process for employees, as well as monitoring the fulfilment of the programme's objectives and goals.

The administrative head of the Villanueva Operational Unit must manage the delivery of waste for final disposal and must monitor the proper management of chemicals and fuels in the workplaces.

8.1.5 Control of atmospheric emissions and noise

8.1.5.1 Outreach

The atmospheric emissions and noise control programme is aimed at the development of activities in Refocosta S.A.S. work centres, and must be complied with by employees, customers and visitors. It is aimed at mitigating the impact of gas, particulate matter and noise emissions.

8.1.5.2 Target

Mitigate impacts on air quality.

8.1.5.3 Targets

✓ Ensure compliance with the actions of this programme.
✓ Train 100% of the staff on issues related to atmospheric emissions control, mainly transporters.

8.1.5.4 Actions

- Atmospheric Emission Control Guidelines: Gases and Particulate Matter

  ✓ For road maintenance, as well as other activities involving earth moving, soil wetting should be carried out to avoid dispersion of particulate matter. Wind direction should always be considered to avoid impact downwind of the activity site.
  ✓ Strict control of vehicle speeds should be established, with a maximum speed limit of 10 kilometres per hour at work sites and 30 kilometres per hour in other areas. It should be accompanied by signage to indicate these maximum speeds.
  ✓ All personnel must be provided with personal protective equipment, such as masks, glasses, among others, to avoid the generation of respiratory diseases from the dust and the generation of emission gases.
  ✓ The areas affected by earthworks shall be minimised. Additional movement of materials or extraction of material that has not been previously contemplated shall be avoided.

- ✓ Particulate matter and gases are also emitted by the exhaust of the vehicles and machinery to be used, for which they must undergo a preventive maintenance programme before starting work. Prior to entering the work areas, the vehicles and machinery to be used must have a technical inspection by a certified body to ensure that they are in good working order.
- ✓ Preventive and periodic maintenance of the equipment to be used during the various activities of the project will be carried out in order to ensure its good condition and reduce gas emissions.
- ✓ Any burning or incineration of waste generated within the Project area is prohibited.

- Air Emission Control Guidelines: Noise

- ✓ All motorised equipment shall be fitted with optimally functioning silencing devices to minimise noise emission as far as possible.
- ✓ The use of sirens or other unnecessary noise sources in vehicles shall be prohibited to avoid increasing noise levels. Sirens shall only be used in cases of emergency.
- ✓ Similarly, it shall be prohibited to remove silencers which attenuate the noise generated by the exhaust from any vehicle or to fit any device in the exhaust pipes which produces more noise.
- ✓ In areas where noise is generated, workers must use personal protective equipment in accordance with the activity to be carried out.
- ✓ Preventive and periodic maintenance of the machinery and equipment to be used during this stage will be carried out in order to guarantee their good condition and reduce noise emissions.
- ✓ At the time of felling, equipment should be used that generates the lowest noise levels, in order to avoid affecting neighbouring populations and scaring away wildlife.

8.1.5.5 Responsible

The sustainability management is in charge of guiding and executing the training process for employees, as well as monitoring the fulfilment of the programme's objectives and goals.

The administrative head of the Villanueva Operational Unit shall implement the actions of the programme in the workplaces.

8.2 Biotic environment

8.2.1 Management of conservation areas

Taking into account that in the area of current operation of the forest plantations, there is an additional area of native vegetation, which acts as a buffer zone for the protection of the watercourses found there and which is mainly made up of gallery and riparian forest and high secondary vegetation, the main management measures to be implemented to guarantee the protection of these areas are presented below.

In this regard, it is important to mention that many of these measures are already expressed in the environmental management plan currently implemented by Refocosta as part of its social responsibility and sustainability strategies, as well as the requirements of the Forest Stewardship Council (FSC) certification.

8.2.1.1 Outreach

This programme is aimed at the areas surrounding the forest plantations in Villanueva's area of operations, in order to maintain and increase the protection of the habitats in the areas defined as conservation areas.

8.2.1.2 Target

Maintain the quality of the habitats in the natural areas established as conservation areas, within the lands where forest plantations are established in the Villanueva operational area.

8.2.1.3 Targets

- Maintain at least 10% of the total area under timber production as a protection area.
- Control 100% of threats to conservation areas from external actors.

8.2.1.4 Actions

In coordination with the management plan currently being implemented by Refocosta for the area, the following actions to be developed are presented.

- Continue with the periodic measurement (at least every year), of the conservation areas from updated satellite images, within the three properties corresponding to the project, in order to verify changes (increase or decrease) in the areas destined for protection and conservation.
- Adequately maintain the protective fences of protected areas, especially those that are located towards third parties' properties or that have some kind of public flow or become permanent transit areas for people.
- When carrying out planting and maintenance operations (pruning, thinning) in areas adjacent to conservation areas, avoid falling branches or excessive movement of personnel in these areas to prevent damage to natural regeneration.
- During fire control and road maintenance activities, avoid affecting natural areas, except where it is technically proven that the growth of these areas may pose a risk to the plantations.
- Maintain training strategies with the company's workers, as well as with nearby residents, especially neighbours and in general the people who pass through the plantation areas,

in order to generate awareness of the importance of these areas in the maintenance of diversity and the regulation and supply of environmental goods and services.

- Taking into account that in some areas, especially those with high secondary vegetation, there is still evidence of *Pinus caribeae* species, manage the removal of these individuals in order to avoid competition with native vegetation.

8.2.1.5 Responsible

Management and technical team in charge of the project in the Villanueva operational area.

8.2.2 Wildlife

As part of the environmental baseline, in the characterisation of wildlife for the Villanueva Operational Unit (UOVN) of Reforestadora de la Costa S.A.S., it was found that in the area there is a species of mammal with a category of threat: the palm bear (Myrmecophaga tridactyla), with a category of Vulnerable (VU). Likewise, several species of all the wildlife reported are included in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), in its Appendix II. Table 25:

Table 25- Fauna recorded and listed in the CITES Appendices Villanueva Operational Unit area

Family	Species	CITES Appendix
Herpetofauna - Reptiles		
Testudinidae	*Chelonoidis carbonaria*	II
Podocnemididae	*Podocnemis vogli*	II
Iguanidae	*Iguana*	II
Avifauna		
Accipitridae	*Ictinia plumbea*	II
	Buteogallus meridionalis	II
	Rupornis magnirostris	II
	Geranoaetu albicaudatus	II
Falconidae	*Falco sparverius*	II
	Falco femoralis	II
	Milvago chimachima	II
	Herpetotheres cachinnans	II
	Caracara cheriway	II
Psittacidae	*Amazona ochrocephala*	II
	Amazona amazonica	II
	Ara macao	II
	Aratinga pertinax lehmanni	II
Strigidae	*Megascops choliba*	II
	Athene cunicularia	II
	Tyto alba	II
Trochilidae	*Amazilia fimbriata*	II
	Phaethornis malaris	II
Mastofauna		

Family	Species	CITES Appendix
Megalonychidae	*Bradypus variegatus*	II
Myrmecophagidae	*Myrmecophaga tridactyla*	II
Canidae	*Cerdocyon thous*	II
Felidae	*Leopardus pardalis*	I
	Puma yagouaroundi	II

- In order to protect these species, it is necessary to implement management measures, which basically consist of the following:

- Develop awareness and environmental education workshops with the workers of the Villanueva Operational Unit (UOVN), as well as with the community in the area of influence of the project, so that these actors recognise the importance of these species, their ecological function, as well as awaken a sense of belonging for their natural resources, their flora and fauna. It also discourages undesirable practices against wildlife such as hunting and extraction of specimens.

- Implement informative signage on the presence of wildlife in places of passage or transit, for example, the internal roads between the lots of the plantation, in places where natural vegetation cover makes contact with the internal roads between the lots of the plantation, or towards the municipality of Villanueva. This signage should also inform about the prohibition of the extraction of fauna specimens, which is done for different purposes, such as protein sources, pets, etc.

- Carry out annual monitoring in the cover areas (including the plantation) of the area of influence of the Villanueva Operational Unit (UOVN), in the groups of herpetofauna (amphibians and reptiles), avifauna and mastofauna. Special emphasis will be placed on the species reported here with threat categories and those included in Appendix II of CITES.

- Ensure the protection of natural habitats for wildlife, i.e. protect patches of vegetation marginal to water bodies, bushland, water bodies in general.

8.3 Socio-economic environment

8.3.1 Equal Opportunity Labour Linkage Programme

8.3.1.1 Outreach

In accordance with Refocosta's Integrated Management Policy - Social Responsibility, this labour recruitment programme is aimed at promoting the generation of employment in the municipality of Villanueva for the development of Refocosta's operational activities, under fair and equal conditions for men and women, in order to contribute to the improvement of the living conditions of the population living in the area of influence.

8.3.1.2 Objectives

✓ Promote the working-age population in the area of influence to become involved in the operation.

- ✓ Promote the reduction of wage and occupational gaps between men and women.
- ✓ Publicise the established labour recruitment procedure.
- ✓ Generate compliance with the established labour recruitment process.

8.3.1.3 Targets

- ✓ Mechanism for gender-sensitive selection and recruitment of local labour implemented.
- ✓ Hiring of skilled and unskilled labour required for the operation, located in the area of influence, according to the needs and complying with the contracting procedures established by Refocosta, seeking the insertion of women.

8.3.1.4 Actions

The hiring of skilled and unskilled labour in the area of influence will be carried out under the human talent procedures established by Refocosta and will include the following activities, among others:

Means should be provided for the receipt of resumes, such as:

- ✓ Refocosta facilities.
- ✓ E-mail.
- ✓ Website

In meetings with stakeholders, the vacancies, the processes for the recruitment of unskilled and skilled workers, the minimum requirements for recruitment, the recruitment procedure, the description of the profiles required for the different activities and the strategies designed for the implementation of the gender approach will be made known.

As minimum requirements for the receipt of documentation, the following shall be taken into account:

- ✓ Resumes are received with at least the following points: personal details, contact details, education and work experience.
- ✓ It should be clarified that the receipt of the curriculum vitae does not commit Refocosta to the applicant for recruitment and in that order, it will have to strictly comply with what is indicated in this document.

8.3.1.5 Responsible

The Administrative and Human Resources Directorate, through its representative in the Villanueva operation, will be the area in charge of coordinating and executing the labour recruitment programme.

8.3.2 Programme for the prevention of harassment and violence against women

8.3.2.1 Outreach

In accordance with Refocosta's Integral Management Policy - Promotion of human rights, this programme defines measures to prevent the incidence of violence and sexual harassment in the presence of mostly male workers against women (adults, girls and adolescents) and/or towards female workers of the company, contractors and subcontractors.

8.3.2.2 Objectives

- ✓ Avoiding or minimising the hiring of foreign workers, and focusing on the use of local labour (skilled and unskilled).
- ✓ Raise awareness among workers and contractors about the importance of addressing violence against women in different activities, its implications and the mechanisms that exist for its attention and prevention.
- ✓ Formulate the inter-institutional coordination mechanism for the referral of acts of violence against women so that they are supported and attended to in a relevant and timely manner by justice, security and/or health entities.
- ✓ Conduct awareness-raising and training processes for workers on the situation and punishment of violence against women, the application of community relations rules and the code of conduct that consider the approach and prevention of violence.

8.3.2.3 Targets

- ✓ As far as possible, reduce the percentage of foreign workers.
- ✓ 100% of the operation's workers participate in education and awareness-raising processes on women's rights, mechanisms for the prevention, protection and punishment of violence.
- ✓ Zero tolerance for violence against women in its different manifestations, crimes of a sexual nature, sexual harassment, aggressive and abusive behaviour against women (adults, girls and adolescents) from the communities in the area of influence and towards women workers, contractors and subcontractors.

8.3.2.4 Actions

- ✓ Implementation of a training process to influence the understanding and awareness of workers on how to deal with violence, the correct handling of complaints, the monitoring of the requests, complains, claims and suggestions mechanism (PQRS, by its Spanish initials – Peticiones, Quejas, Reclamos y Sugerencias), the importance of applying preventive measures and possible sanctions for workers who commit transgressions.
- ✓ Formulation and implementation of the code of conduct to prevent harassment and violence. All employees and contractors (subcontractors, consultants, advisors, supervisors) must observe, commit to and sign the code of conduct which defines guiding

principles, obligations to be fulfilled, rules of conduct or prohibited conduct, sanctions in case of transgressions.

- ✓ Purpose of the code of conduct: the participation of workers in a healthy, respectful and safe environment. Likewise, to promote harmonious relations with the communities in the area of influence, particularly with women (adults, girls, adolescents), through respectful treatment that values their humanity and recognises their rights.

- ✓ Scope of application: in all activities carried out for the development of the operation, inside and outside the facilities and in any space of coincidence and interaction with the community.

- ✓ Among the principles to be observed: A) respect for the specific human rights of women in particular the right to a life free of harassment and violence. B) zero tolerance, there is no justification whatsoever for the exercise of harassment or violence against women, girls and adolescents, sex workers, LGBTI population. C) observance and enforcement of existing legislation that protects women and punishes the different manifestations of harassment, violence and sexual crimes.

- ✓ Prohibited conduct: A) The exercise of any kind of harassment and/or violence against women of any age, social or economic status, socio-cultural group is strictly prohibited. This includes physical, psychological, sexual and economic violence, femicide, rape, sexual aggression, sexual exhibitionism, distribution of pornographic material to minors, violation of sexual privacy, promotion of prostitution, paid sexual activities with minors, production of pornography with minors, possession of pornographic material of minors, sexual harassment, aggressive and abusive behaviour. B) aggressive, abusive behaviour and sexual harassment against women in the street, on public transport, in the workplace, i.e. acts related to explicit or implicit unwanted sexual advances, requests for sexual favours, physical contact with sexual connotations, harassment, comments, gestures, looks or non-verbal, written, electronic actions with images of a sexual nature. C) making derogatory or negative comments about another person's sexual orientation or gender identity; using insults with sexual connotations or referring to non-heterosexual sexual preferences. D) it is prohibited to make threats, resort to intimidation or use any retaliation against a person who has filed a complaint or report for misconduct, sexual harassment, comments against LGBTI people. E) the use of illegal substances and alcoholic beverages is prohibited during working hours and on the premises.

- ✓ Complaint mechanism: people who feel aggrieved or consider that they have been subjected to any conduct defined as prohibited, can use the external or internal PQRS mechanism in any of its communication channels.

- ✓ Disciplinary sanctions: any conduct that has been established as prohibited will be sanctioned, however, the disciplinary measure will depend on the circumstances and seriousness of the act.

- ✓ Where women workers (skilled and unskilled) are employed, there shall be separate facilities and services for women and men, with adequate lighting, so that their safety, security and comfort are safeguarded and privileged.

- ✓ Implementation of re-education and awareness-raising processes on harassment and violence in its different manifestations, specific women's rights, legislation for the

protection of women and specific criminal sanctions. The training is intended to persuade about the implications of incurring these offences and to raise awareness of the code of conduct.

✓ Through the monitoring and supervision of the Prevention Plan, periodic re-evaluations of the risks identified will be carried out so that rectifications, modifications, corrections and adaptations of the prevention measures can be made.

8.3.2.5 Responsible

The Sustainability Management, the Administrative and Human Resources Directorate, through its representative in the Villanueva operation, will be the area in charge of coordinating and executing the programme for the prevention of harassment and violence against women.

8.3.3 Participation Programme, Consultation and PQRS Mechanism

8.3.3.1 Outreach

In accordance with Refocosta's Integrated Management Policy - Understanding and meeting needs and expectations, inform stakeholders in the area of influence of the operation, authorities and civil society about the different activities to be carried out. Implement and maintain a communication channel through the registration of requests, complaints, claims and suggestions that allows for clear, timely and effective processing and response to requests related to the operation.

8.3.3.2 Objectives

- Provide informative spaces to communicate information on the operation in a timely manner.
- Develop outreach strategies to disseminate relevant information.
- Address and evaluate proposals from the population arising from the operation, in order to include them in the design of impact management measures.
- Facilitate decision-making processes through participatory dialogue with the population.

8.3.3.3 Targets

✓ Design, preparation and implementation of one (1) stakeholder plan.

✓ Design, preparation and implementation of one (1) PQRS mechanism.

8.3.3.4 Actions

✓ Stakeholder identification includes socialisation meetings, extraordinary meetings with different stakeholders to address specific issues related to the operation.

- ✓ Call for proposals
- ✓ Prepare presentation
- ✓ Distribution of the notice 10 days in advance of the meetings.
- ✓ Attendance register.
- ✓ Record the proceedings of the meeting in minutes.
- ✓ Take photographic record.
- ✓ Procedure for the recruitment of labour
- ✓ Specific topics to facilitate interaction and engagement with communities
- ✓ Complaints and claims procedure
- ✓ Questions and suggestions

Dissemination strategies: when the activities so require, the delivery or distribution of informative material will be carried out to inform about new developments in the activities, using different informative pieces.

- Reception of PQRS

Indiscriminately, interested parties may submit PQRS verbally, in writing or virtually, through the following communication channels:

- Refocosta facilities.
- E-mail.
- Website.
- Telephone line.

- Types of petitions

- **Information Requests**: Requests for information on activities, projects, operations, procedures and/or services.
- **Request for Copies:** Copies of documents that are not confidential.
- **Consultation**: A request for you to express an opinion, opinion or judgement on a certain subject, related to your functions or situations within your competence.
- **Complaint**: A manifestation of non-conformity
- **Reporting of** any manifestation of violence against women, sexual harassment, aggressive and/or abusive behaviour
- **Complaint**: presentation of disagreement with the project due to inadequate provision of services, or refusal to comply with them.
- **Suggestion**: Expression of an idea or proposal to improve the provision of a service or institutional management.
- **Congratulation or thanks**: Expression of satisfaction with the service.

- Procedure for Attention

- When a stakeholder submits a petition, complaint, claim or suggestion, a form for the reception of petitions, complaints, claims and/or suggestions shall be filled out in an orderly and systematic manner for each of its items.

- The PQRS will be analysed and classified according to their typology: request, complaint, claim or suggestion.
- When identifying a complaint of violence against women, sexual harassment, aggressive and/or abusive behaviour you should:
    - Separate from the rest of the communications received in order to provide immediate and differentiated follow-up, safeguarding the confidentiality of the complainant.
    - If necessary, the PQRS will be transferred to the corresponding area, which will be responsible for issuing the response.
    - Once the response is issued, the communication will be sent to the petitioner, which may be received directly by the user, by registered mail or by e-mail.
    - Confirm with the petitioner the closure of the PQRS.

- Time taken to respond to PQRS

The terms in which the different types of Petition must be resolved are as follows:

- Petitions: Fifteen (15) days after receipt.
- Requests for documents: Ten (10) days after receipt.
- Consultation Requests: Fifteen (15) days following receipt.
- Claims: Fifteen (15) days after receipt.
- Complaints: Fifteen (15) days after receipt.

- Withdrawal or abandonment of the PQRS

If the interested party submitting the Petition, Complaint, Claim or Suggestion does not provide the documents or complete information within thirty calendar days from the date of sending the request, and once the instances to obtain the information have been exhausted, it will be understood that the petitioner has withdrawn his request or the action, unless he requests an extension before the expiry of the required period.

In the event that, for any reason, the interested party cannot be located, taking into account the personal information provided in the PQRS reception form, it will be sent by registered mail and the PQRS will be closed. In both situations the PQRS will be archived, leaving a record of such agreement in the respective file.

8.3.3.5 Responsible

The Sustainability Management, through its representative in the Villanueva operation, will be the area in charge of coordinating and executing the participation programme, consultation and PQRS mechanism.

8.3.4 Road safety programme

8.3.4.1 Outreach

In accordance with Refocosta's Integrated Management Policy - Risk Management and Opportunities for Continuous Improvement, this programme promotes preventive measures to reduce the risk of accidents and to make the transit of people and vehicles using the road safe.

8.3.4.2 Targets

- Implement 100% of signage to prevent accidents for workers, contractors and/or the general population.

- Communicate the traffic management plan to local and departmental authorities and bodies responsible for road safety in the municipality.

8.3.4.3 Actions

- Adequate signage must be provided in advance and in the location according to safety standards. Protective fencing and reflective markings should be provided to guide drivers both day and night.

- When work is being carried out on the road, the area must be marked with signs prohibiting the passage of traffic or indicating the slowing down of traffic in accordance with safety regulations. Traffic restrictions must be signposted in a timely manner.

- It is important to do induction with workers about road safety, speed limits, traffic rules, among others.

8.3.4.4 Responsible

Sustainability Management, through its representative in the Villanueva operation, will be the area in charge of coordinating and executing the participation, consultation and PQRS programme.

8.3.5 Occupational Health and Safety Programme

8.3.5.1 Outreach

In line with Refocosta's Integrated Management Policy - Providing safe and healthy workplaces. This programme aims to promote the well-being at work of the personnel involved in the operation.

8.3.5.2 Target

Implement the Integrated Health and Safety Plan for the operation, which complies with the requirements of the legislation, as well as the requirements established by international standards.

8.3.5.3 Targets

- ✓ Develop a training programme according to the different job profiles of the project.
- ✓ Implement the occupational health, hygiene and safety programme.
- ✓ Develop an induction programme.

8.3.5.4 Actions

The following activities will be carried out for workers:

- ✓ Ensure that they have employees who are appropriately qualified in Occupational Health and Safety.
- ✓ In the Villanueva operation, ensure adequate hygiene and safety conditions in social areas, in particular in the dining room and bathrooms.
- ✓ Prior to commencing work, workers should be trained in: (a) potential risks associated with the activities they will undertake, (b) safety measures, (c) first aid.
- ✓ It must be ensured that all workers have personal protective equipment and make permanent use of it during their stay on the premises.
- ✓ In case of accidents or incidents involving workers, they shall be reported immediately after they occur.
- ✓ Take necessary preventive measures, information and training of workers on risk behaviour and preventive care.
- ✓ Technical, administrative, industrial safety, occupational health and safety (SISO) and socio-environmental induction.
- ✓ Programming of education and training days.
- ✓ Dissemination and communication strategies.
- ✓ Monitoring and control strategies.
- ✓ All biosecurity measures in place to prevent the spread of COVID 19 must be taken and workers must be tested regularly on a random basis.
- ✓ When a positive case is identified, epidemiological surveillance should be carried out to identify recent contacts and possible infected persons, and tests should be performed to confirm or rule out infection.
- ✓ If possible, vaccination certificates should be requested.

The following community-focused activities will take place:

- ✓ Establish a Code of Conduct for all workers at the operation, outlining their rights and obligations, including guidelines for relations with the local community. This Code should be disclosed and explained to employees during recruitment and signed at the time of signing the employment contract. Non-compliance with this code should be associated with wage penalties and, in serious situations, dismissal of offenders.
- ✓ Undertake awareness-raising actions for workers regarding: i) inappropriate behaviours to avoid in contact with the community; ii) promoting respect and good relations with the community; iii) avoiding health risk behaviours and adopting preventive care to avoid infectious diseases and sexually transmitted diseases.
- ✓ With regard to sexually transmitted infections, it is recommended that condoms be made available to workers.
- ✓ In the event that it is necessary to contract security services to protect workers and assets related to the works, it is essential to ensure that the security personnel contracted for this purpose behave appropriately, without the use of force disproportionate to possible conflict situations, avoiding significant risks to the community.

8.3.5.5 Responsible

The Sustainability Management, through its representative in the Villanueva operation, will be the area in charge of coordinating and executing the participation programme, consultation and PQRS mechanism.

9 RECOMMENDATIONS

- Clearly define an environmental responsible for the Villanueva Operational Unit, with roles and chain of communication with the sustainability management. In the Environmental Management Plan established by Refocosta it is mentioned as responsible for most of the actions of the programmes, however, during the field visit, it was not possible to verify this role.

- Incorporate regional climate change and risk scenarios in the hazard and vulnerability analysis of the Risk Management Plan. It should be borne in mind that the increase in temperature and the reduction in precipitation aggravate the frequency and possibility of damage from these events (landslides, forest fires), so it is necessary to generate preparedness and adaptation measures.

- Establish and implement the Carbon Footprint reduction Action Plan, based on the definition of the specific contribution to these scopes of the Villanueva Operating Unit, corporate emission reduction targets to continue with the optimisation of processes that lead to a greater reduction or to the achievement of the targets set by the organisation.

- Articulate Refocosta with the goals of the Nationally Determined Contribution (NDC 2020) Colombia, whose national objective is to reduce national emissions of Greenhouse Gases to 51% by 2030; as well as with the goals of the Integrated Sectoral and Territorial Climate Change Management Plans. It is clarified that subscribing to these country strategies is voluntary, and is not subject to an environmental compliance obligation.

- Address the recommendations, non-conformities or evidence generated by the environmental impact assessment carried out in 2019 and the FSC Forest Management Certification Report of re-assessment (NEPCon, 2018). These are:

    i) The camp areas must have a dumping permit or a written statement from CORPORINOQUIA stating that there is no need for such a permit.

    ii) It is necessary that all company buildings have a wastewater collection and treatment system (septic tanks). In this sense, it is appropriate to have a maintenance procedure for septic tanks and a maintenance schedule.

    iii) It is necessary to continue with the revision of the integrated solid waste management programme and ensure its implementation.

    iv) It is necessary to register with the IDEAM, the Registro Único Ambiental y de Generadores de Residuos Peligrosos through CORPORINOQUIA, in accordance with the particularities of resolution 1362 of 2007.

    v) At agrochemical storage sites it is necessary to have all the safety data sheets of the stored products, to label them correctly following the guidelines of the Globally Harmonised System.

vi) Document a programme to optimise the use of pesticides (herbicides, fungicides and insecticides) that allows for evidence of the historical reduction of quantities used or their substitution by more environmentally friendly active ingredients.

- ✓ In general, the protection areas are in an adequate state, forming forest cover, in which a successful successional dynamic is developing towards more consolidated ecosystems. However, it is important to continue with the detailed monitoring of these areas, to avoid deterioration due to the entry of people or animals in search of wood or other resources.

- ✓ Carry out passive wildlife repelling work at the work fronts in order to protect the specimens that have a close relationship with the habitat offered by the plantation.

- ✓ Rescue individuals of wildlife that have not responded to the chasing for various reasons such as: Precarious mobility (sick, old, disabled), neonates, amphibians and some fossorial or semi-feral specimens. The possibility of establishing an agreement with CORPORINOQUIA could be explored for their transfer and even rescue.

- ✓ Evaluate the possibility of seeking an alternative to chemical control of army ants, exploring physical mechanisms (destruction or relocation of nests) and biological control, given that ants are a food resource for several species of wildlife, which, when consumed after fumigation, can affect individuals.

- ✓ According to the study, from the point of view of the social aspects analysed, the Villanueva forestry operation mitigates the impacts identified, and the activities proposed within the social ESMP are intended to complement and strengthen the mitigation strategies.

- ✓ The Villanueva operation has been positively recognised by stakeholders, who highlight the benefits for the municipality such as environmental management and local labour, and do not consider significant negative impacts.

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Annex 1: Expansion Area – Forestal VillaBaro

January - 2022

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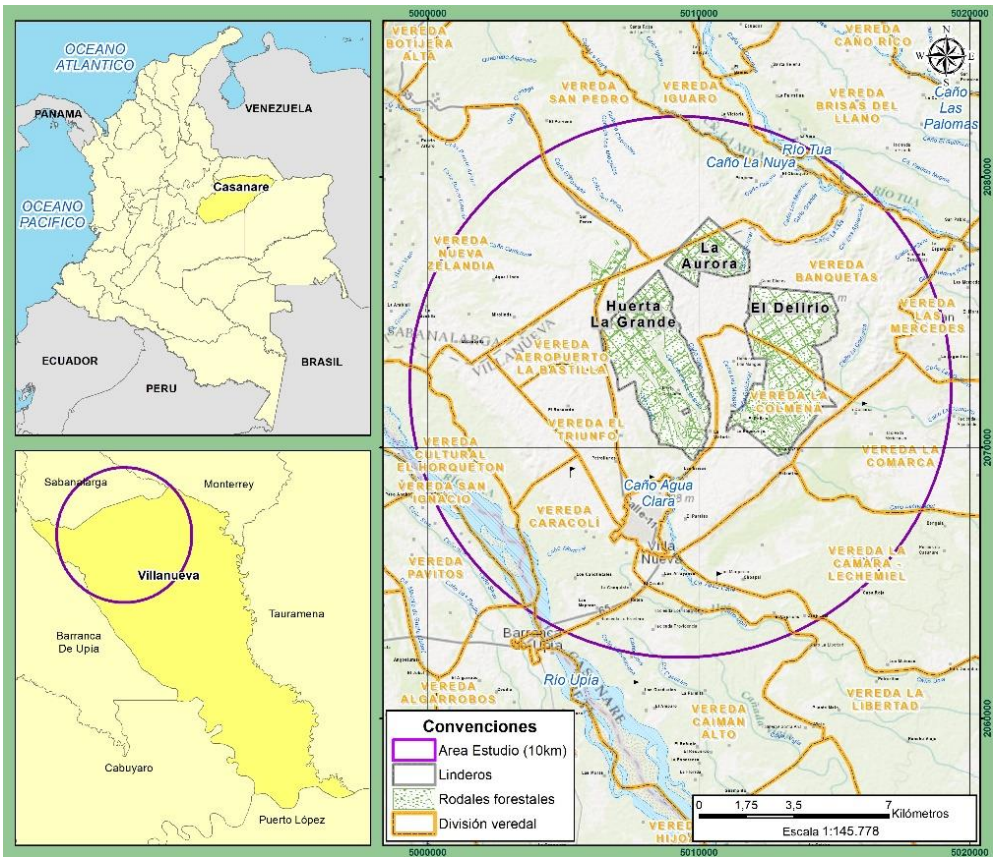
1 INTRODUCTION

In accordance with Arbaro fund's request for a possible expansion of the plantation area in third party properties with an approximate extension of 200 ha, in the surroundings of the current forestry operation in the municipality of Villanueva, so that it can be integrated to the existing 1,800 ha and can be logistically considered as part of the operation, maintaining the efficiency required for transport purposes, for which a study area was delimited, with a radius of 10 km, as shown in Figure 1.

On this area, which covers 27,875 ha (subtracting the current plantation areas), an analysis of environmental, social and legal viability was carried out based on secondary information from official Colombian cartographic sources, and on this basis the viable areas for the development of the project were consolidated.

Figure 29 - Expansion area location



Source: CSG; 2021.

1.1 Methodology

In order to cover all possible constraints for the required expansion area, the analysis was structured in three (3) categories. Environmental, social and legal constraints. For each of these, secondary information from official sources was consulted using freely available mapping software (GIS).

Based on the information on areas of high environmental sensitivity in each thematic area, a preliminary zoning was structured, excluding areas that cannot be used for the project. In this way, the following categories were obtained:

- Exclusion areas: these are areas that cannot be intervened for the planting of new plantations as they correspond to areas of high environmental or social sensitivity, or have a current productive use that makes it difficult to adjust.

- Intervention areas with restrictions: Corresponds to areas with a moderate level of environmental sensitivity, in which new plantations could be carried out, but including additional environmental management measures to avoid environmental damage or deterioration.

- Intervention areas: these are areas where forest species can be planted without any type of environmental restriction.

The analysis and sources of information for each type of constraint are detailed below. In addition, the summary of the methodological scheme followed for the analysis of the identified areas is presented in Figure 31The summary of the methodological scheme followed for the analysis of the identified areas is also presented in the figure below.

1.1.1 Methodology Analysis of environmental constraints

1.1.1.1 Vegetation cover

To analyse this category, the vegetation cover was taken into account, which was extracted from the vegetation cover map of the country (IDEAM, 2017), which is at a scale of 1:100,000 in shp format. Based on this information, cover was classified, excluding those that correspond to gallery forests or other types of forest cover. Additionally, areas with other types of plantations producing both trees and oil palm were excluded.

1.1.1.2 Biodiversity early warning areas

The Tremarctos 3.0 module was used to assess whether the study area contains areas with any type of sensitivity or restriction due to high biodiversity or a high degree of ecosystemic threat. This module compiles official information from different entities such as the Ministry of the Environment, the National Hydrocarbons Agency (ANH), the National Mining Agency, the Alexander von Humbolt Institute for Biodiversity Research (IAvH), among others. This module was consulted on the following page (http://www.tremarctoscolombia.org/).

Based on this module, the areas with sensitive species distribution were established, on the one hand, and on the other, the presence within the study area of those areas prioritised within the red list of ecosystems due to their rarity, high ecosystem values and vulnerability was established.

1.1.1.3 Protected areas

Based on the same Tremarctos module mentioned above, the presence of protected areas, both public and private, at regional and national level, was verified.

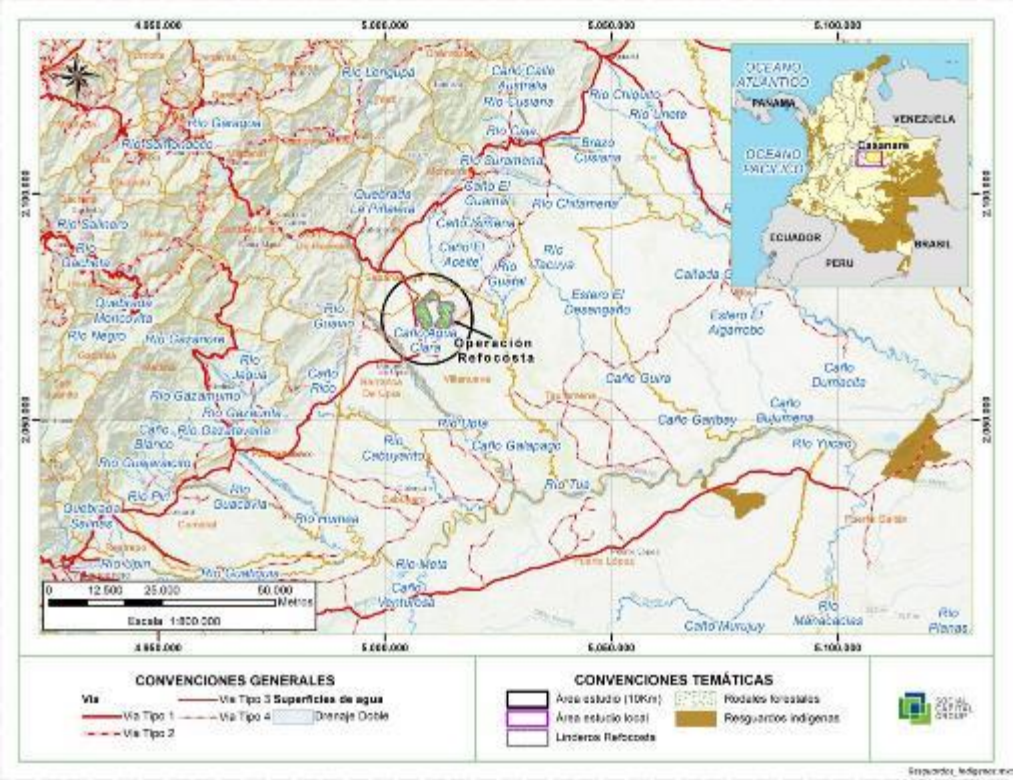
1.1.2 Analysis of social constraints

1.1.2.1 Areas of indigenous and other minority communities

For the analysis of social restrictions, official public information from the Ministry of the Interior was taken into account to rule out the presence of indigenous communities or other ethnic minorities in the area of analysis.

With the cartographic information obtained from the sources consulted to identify the presence of ethnic communities, probable areas of settlement, uses and customs, transit and mobility, the territorial context and the possible relationships that occur in that environment were analysed, it is concluded that there is no presence of ethnic communities (Figure 30).

Figure 30 - Identification of ethnic communities



Source: SCG,2021

1.1.3 Methodology for analysing legal restrictions

A review of the environmental planning instruments in force was carried out, identifying land use restrictions, land use regime, environmental zoning, among other aspects. The following documents were consulted, corresponding to the Villanueva municipality's Land Use Planning Scheme, the POMCA of the Túa river and the PORH of the Agua Clara river:

- CONTROL AMBIENTAL CONSULTING (2014). Revision of the Villanueva-Casanare land-use planning scheme. Justifying Memorandum. Municipal Mayor's Office of Villanueva, Casanare.
- CONTROL AMBIENTAL CONSULTING (2014). Revision of the Villanueva-Casanare land-use planning scheme. Technical support document. Municipal Mayor's Office of Villanueva, Casanare.
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1.1.3.1 Water roundabout areas

Based on the review of the documents listed above, the exclusion zone is established as the zones of the water roundabout, as follows:

a. Micro-watersheds supplying municipal aqueducts: 100 m on both sides of the Huerta La Grande, Agua Clara and Los Mangos streams.
b. 30 metres around other water bodies.
c. 100 m around water catchments (applies to the catchment point of the Villanueva Operational Unit and that of the municipal aqueduct).

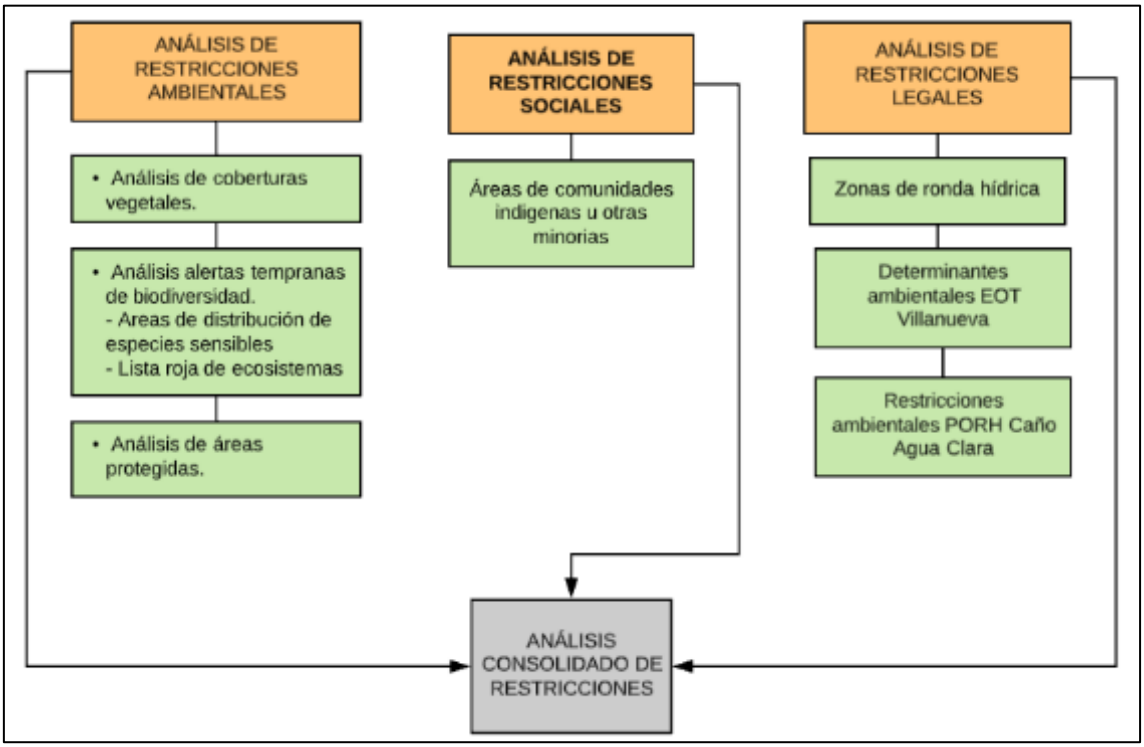
1.1.3.2 Zoning of the POT

The identification of environmental determinants related to water courses and other exclusion zones such as: biological corridors of gallery forests, protective-producing forest reserves, geomorphological units. Buffer is applied for meteorological stations (100 m) and for the national road network: first order roads, 60 m; second order roads, 45 m; and third order roads, 30 m. Taken from the middle of each side of the road axis. Dual carriageway roads, 20 m, on both sides of the road.

1.1.3.3 Zoning of the POMH

Restrictive land uses are identified according to the environmental zoning of the Agua Clara river PORH.

Figure 31 - Methodological scheme for constraint analysis area 10 km



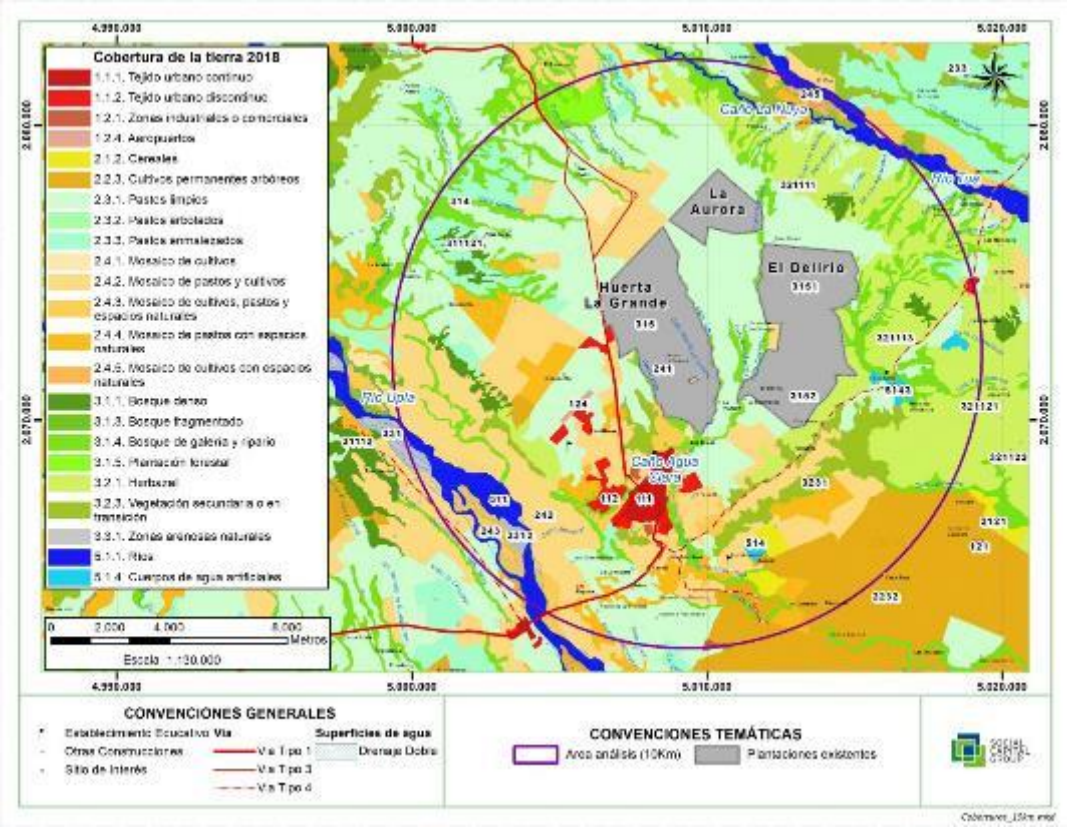
Source: CSG, 2021

2 RESULTS ANALYSIS OF ENVIRONMENTAL CONSTRAINTS

2.1.1 Results of the vegetation cover analysis

In this area, most of the land cover identified corresponds to clean pastures, due to the predominant use of extensive livestock farming in the region. However, there are also palm crops towards the south. On the other hand, there are areas of forests forming elongated patterns which are characteristic of the region and are associated with large rivers and streams.

Figure 32 - Land cover

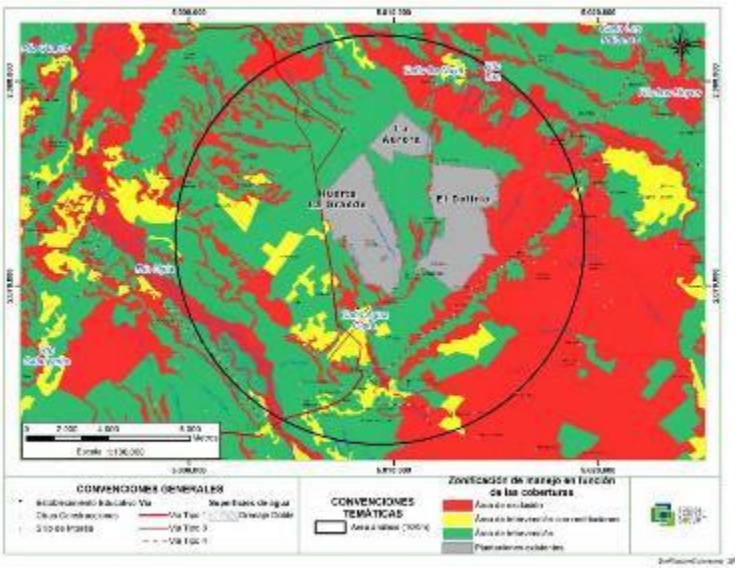


Source: CSG, 2021

According to the cover found, both forests and palm crops were reclassified as exclusion areas, while the pasture areas were left as suitable areas for the project. These are located both to the east and west of the central road that connects with the municipality of Yopal. (

Figure 33).

Figure 33 - Land Cover Zoning

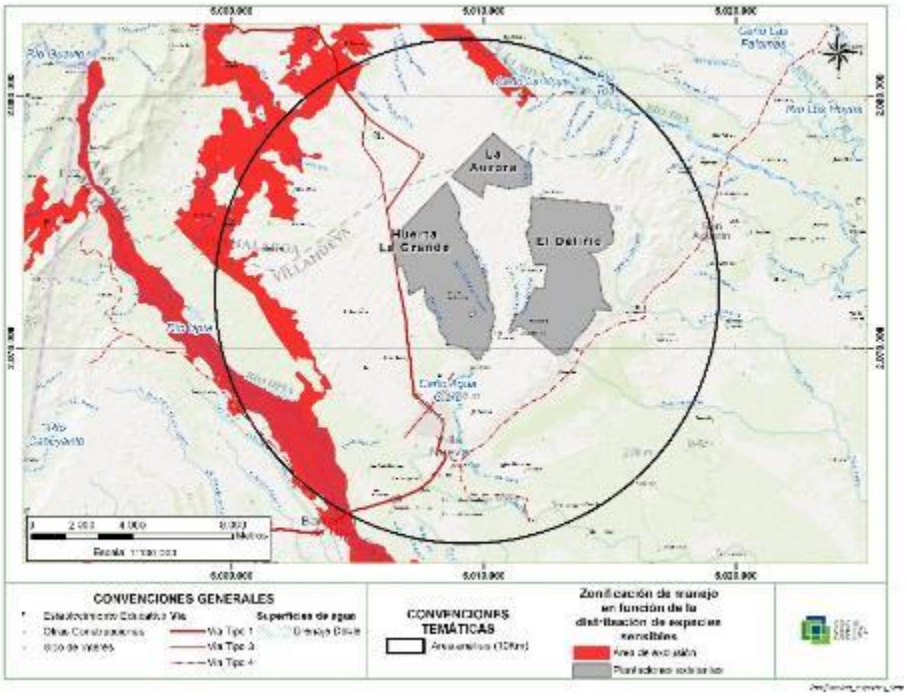


Source: CSG, 2021

2.1.1.1 Results of the biodiversity early warning analysis

In the study area, areas with sensitive species distribution were identified, which are mainly associated with the humid ecosystems associated with the Upía river and which are located to the west of the study area. These were classified as exclusion areas for the project, because although they do not have a legal restriction, they do have a high diversity component. It is important to note that much of this area coincides with existing forest areas.

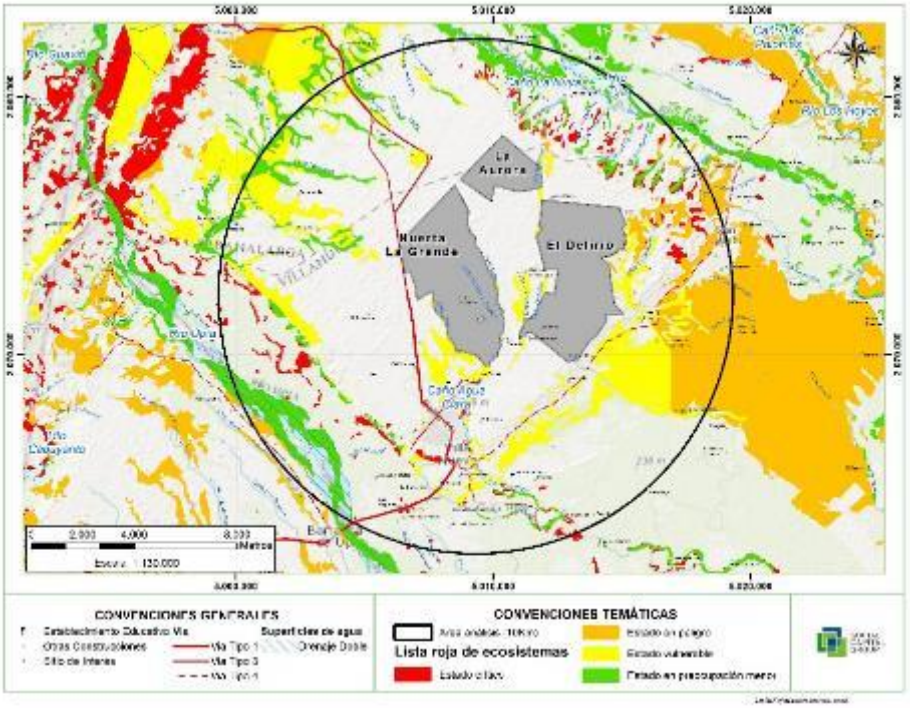
Figure 34 - Areas of distribution of sensitive species in the study area



Source: CSG, 2021

Additionally, according to the consultation to identify areas considered in the red lists of ecosystems, it can be observed that these are minimal in the study area, corresponding mainly to forest relicts located towards the east of the study area, in hillside areas and others associated with water sources distributed towards the southwest.

Figure 35 - Tremarctos LRE Report - Red list of ecosystems

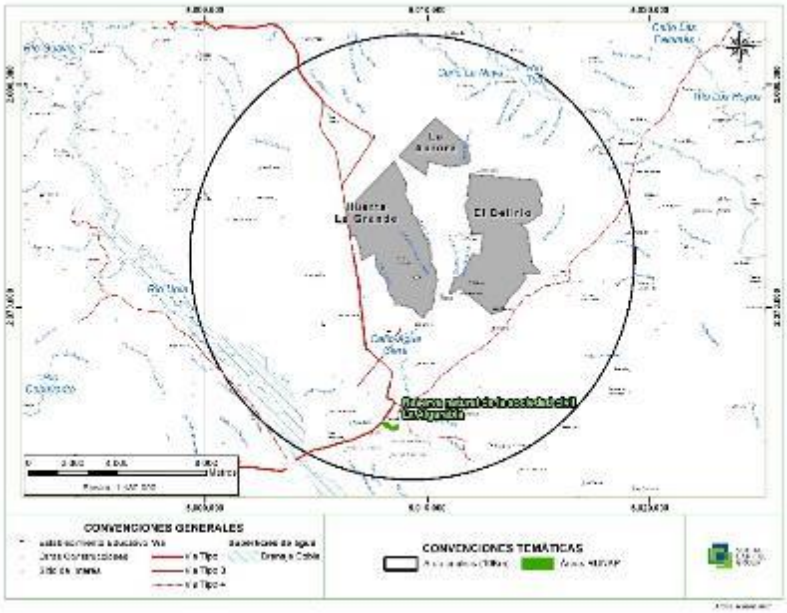


Source: CSG, 2021

2.1.1.2 Results of the analysis of protected areas

Based on the review carried out, within the 10 km radius of analysis there is only one protected area, which is in the category of Civil Society Nature Reserve, which corresponds to a private area. This is called "La Algarabía" and has an approximate extension of 18 ha, and is located in the village of La Libertad in the municipality of Villanueva, to the south of the study area.

Figure 36- Protected areas in the study area

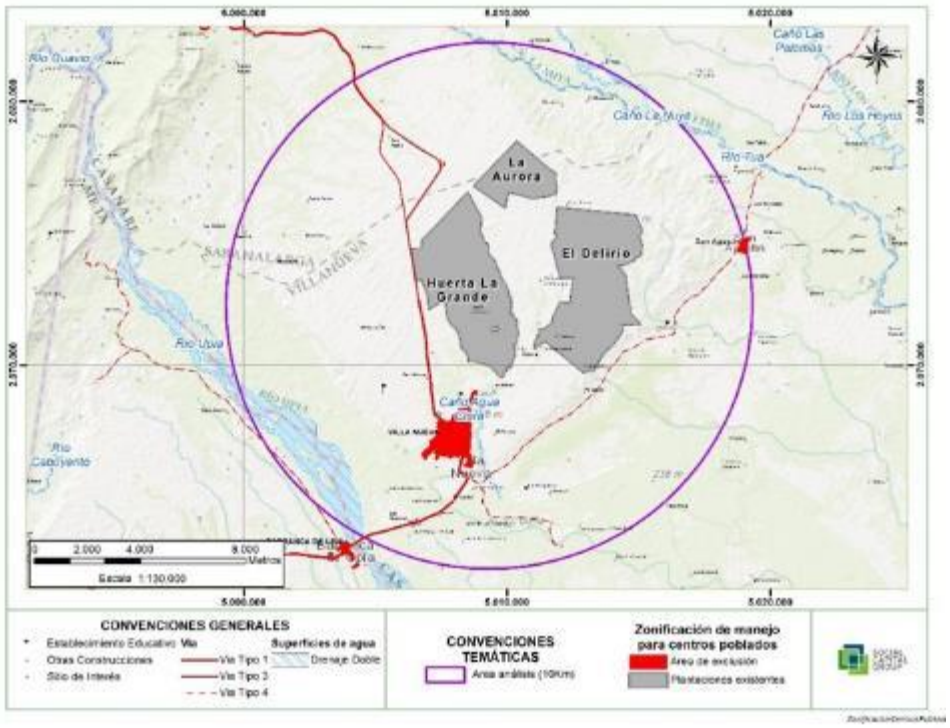


Source: CSG, 2021

2.2 Analysis of social constraints

Based on the analysis carried out, there are no areas of indigenous reserves or other types of titles granted to ethnic minorities in the study area, so the social restrictions for the area are related to the urban centre of the municipality of Villanueva and the town centre of San Agustín. The restriction is due to the fact that the area located outside the urban area was established as urban expansion land and is considered the necessary area for long term urban growth, in accordance with what is indicated in Municipal Agreement No. 037 of December 20, 2000, which adopts the Territorial Ordering Scheme of the Municipality of Villanueva.

Figure 37 Exclusion areas by population centres



Source: CSG, 2021

2.3 Analysis of legal restrictions

2.3.1.1 Results of the analysis of the water catchment areas.

A legal restriction of 30 metres on each side of the stream beds in the study area was incorporated, which should not be part of productive activities, but should be left as protection areas. This same restriction is incorporated within the Villanueva Environmental Impact Study, which is presented in detail below.

2.3.1.2 Results of the analysis of environmental determinants of the Villanueva EOT.

According to the document of the Revision of the Villanueva Land Management Scheme (Alcaldía Municipal de Villanueva y Control Ambiental Consulting, 2014), approved by Municipal Agreement No 010 of 2010, defines the following environmental determinants established by

resolution 300.41.13.0191 of 27 February 2013 by the Corporación Autónoma Regional de la Orinoquia -Corporinoquia. Which are:

d) Environmental determinants for the conservation area

In the case of Villanueva this relates to the Meta River Basin, the Upía River sub-basin with an area of 27,795 ha equivalent to 29.5% of the total area of the sub-basin, and the Tua River sub-basin with 53,932 ha equivalent to 29.13% of the total area of the sub-basin. The data is taken from Corporinoquia's 300.41.13.0191 of 27 February 2013.

e) Micro-watersheds supplying municipal aqueducts

According to Resolution 300.41.13.0191 of 27 February 2013 of Corporinoquia in the municipality of Villanueva, the micro-watershed supplying the Huerta La Grande, Agua Clara and Los Mangos streams must be protected. Both micro-watersheds are located in the area of influence of the project, including the municipal aqueduct intake.

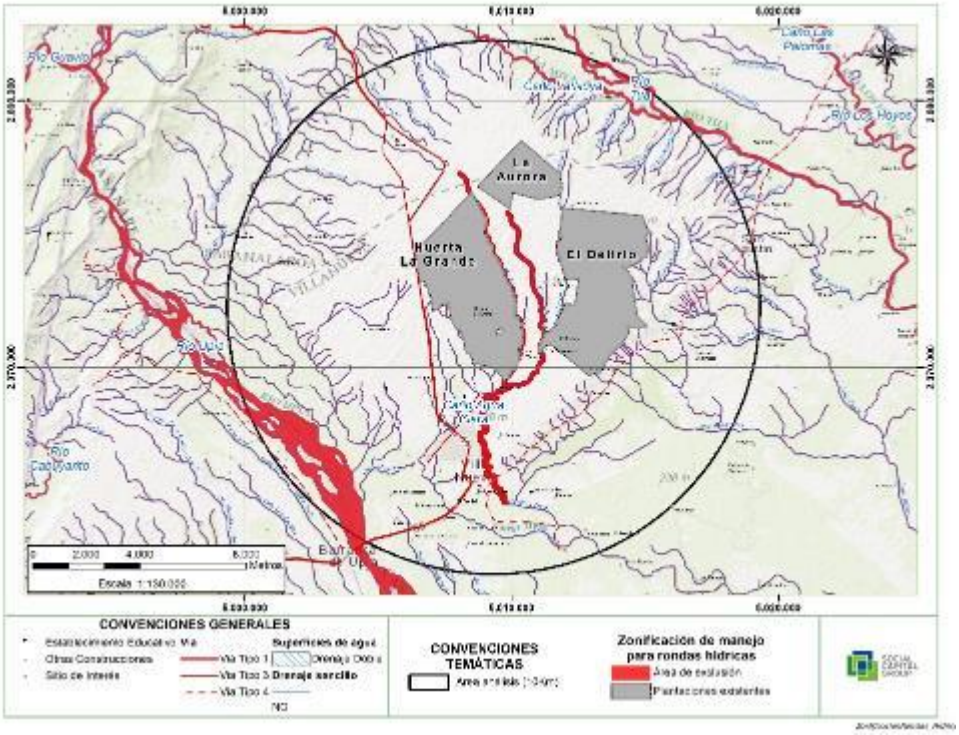
f) Special protection areas

The Agua Clara stream round, comprising the valley formed between the edges of the ravine on each side of the stream and from the confluence of the three main tributaries that form it to the junction with the Villanueva - San Agustín road. This stream is located within the area of influence and is an area of recreational importance for the community. Additionally, according to Corporinoquia's Action Plan PGAR 2016-2019, the Agua Clara stream is a regulated watercourse with PORH with an area of 5,675 Ha.

Regarding the land use regime for these conservation areas, Municipal Agreement No. 010 of 2010 (p. 69), states that "*Any agricultural activity is prohibited in a 100 m strip around these strategic areas; human settlements are restricted around them, polluting discharges are prohibited, whether domestic or industrial, and reforestation plans with native species and natural revegetation will be encouraged. It will be applied to areas for the supply of aqueducts. (...) It also corresponds to the biological corridors of gallery forests". This Main Ecological Structure is made up of the following units:*

Environmental conservation treatment (TCA): 100 m around Aguas Claras water bodies and 30 m around other water bodies. 100 m around water sources (e.g. Refocosta intake and Villanueva municipal aqueduct).

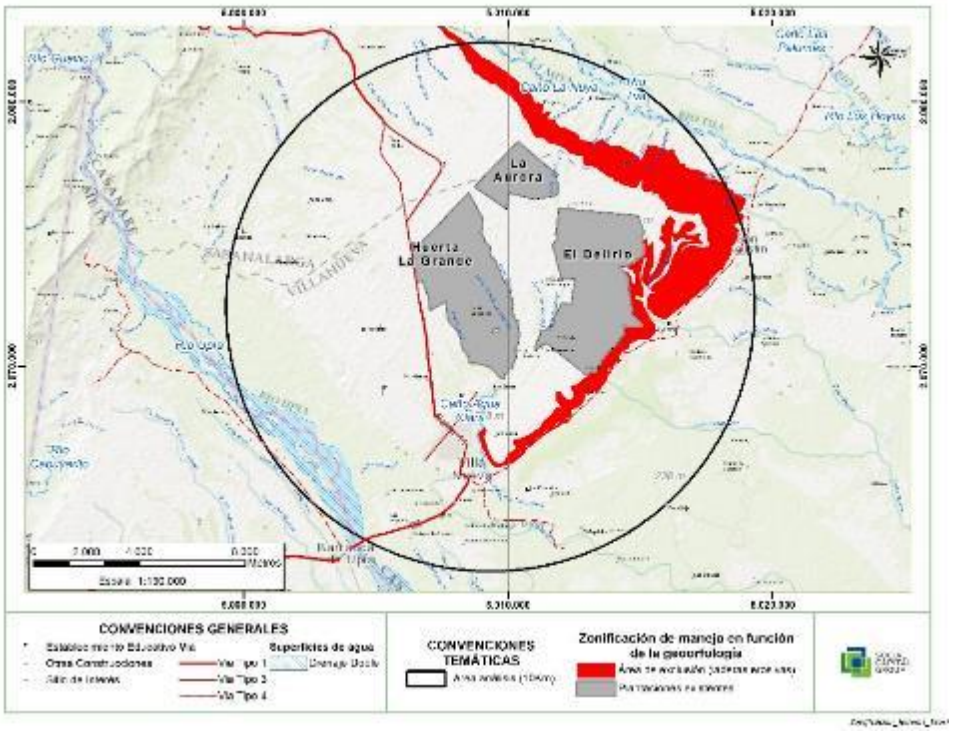
Figure 38 - Areas with restriction by watershed zone of water bodies and supplying micro-watersheds



Source: CSG, 2021

Morphological Recovery Treatment (MRT): Biological corridors of gallery forest, also related to the hilly areas known as the Erosive Slopes geomorphological unit.

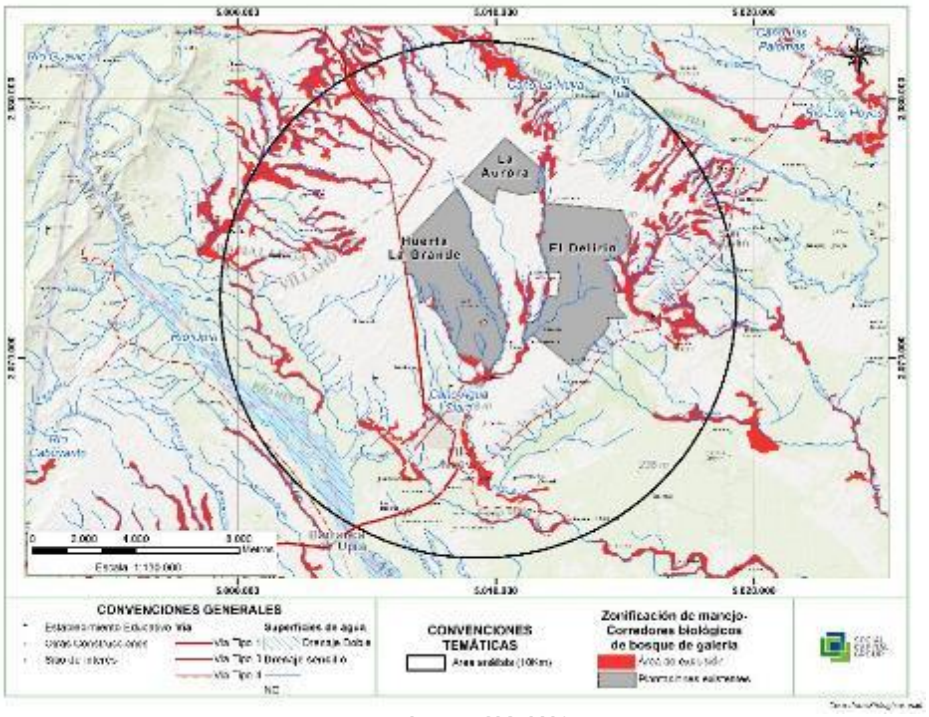
Figure 39 - Villanueva EOT Restriction Areas - Morphological Recovery Treatment (MRT)



Source: CSG, 2021

Integral management treatment (IMT): Protective-producing forest reserves related to important vegetation cover such as natural forest and others in Corporinoquia's jurisdiction.

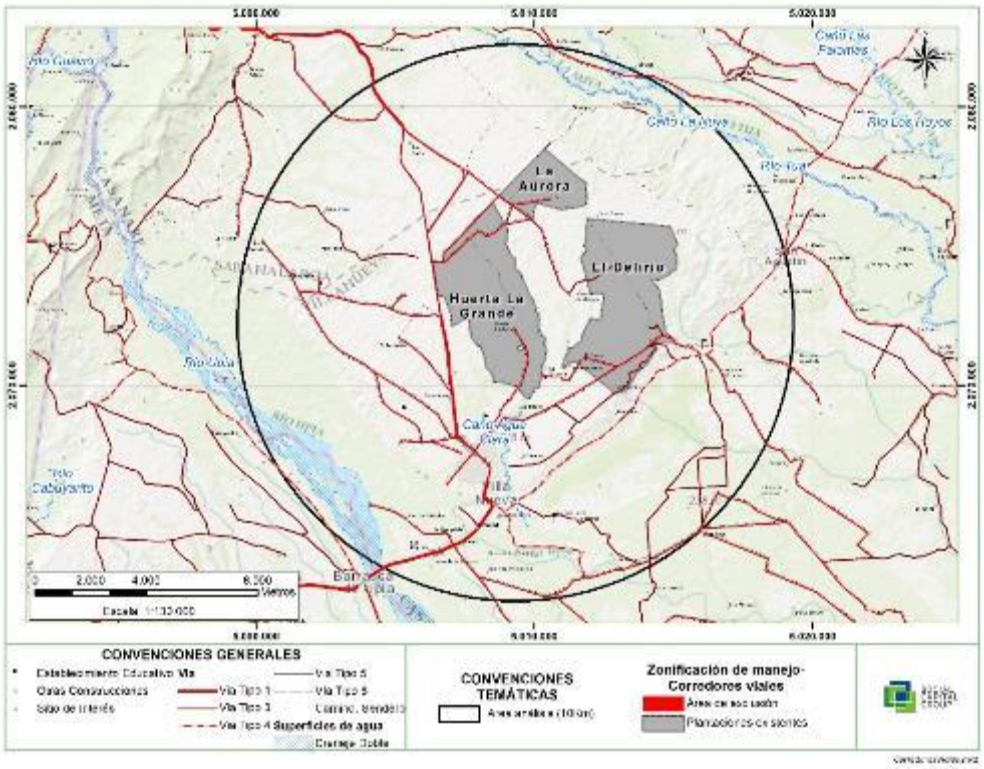
Figure 40 - Villanueva EOT restriction areas - biological corridors



Source: CSG, 2021

Environmental Affectation Treatment (TAA): For the national road network: first order roads, 60 m; second order roads, 45 m; and third order roads, 30 m. Taken from the middle of each side of the road axis. Double carriageway roads, 20 m, on both sides of the road.

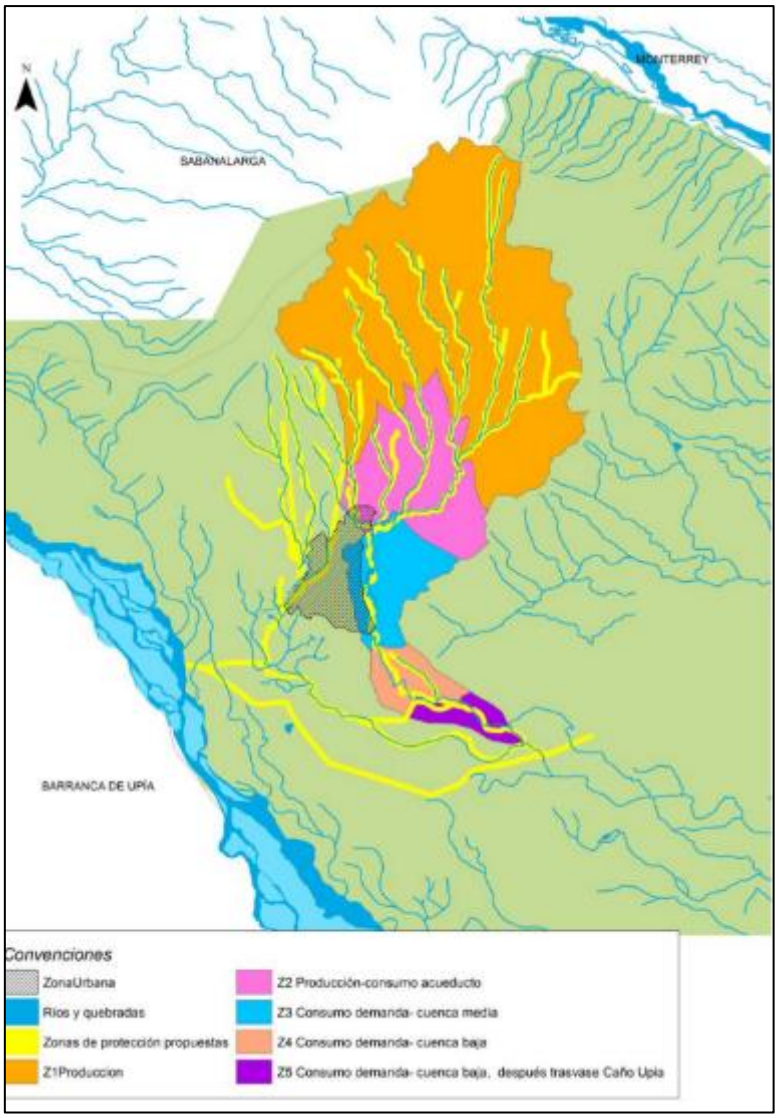
Figure 41 - Villanueva EOT restriction areas - road corridors



Source: CSG, 2021

Now, taking into account the PORH of the Agua Clara river, the project is located in Zone 2 Production-consumption aqueduct, water body protection zones, Z1 Production and Zone 3 consumption-demand middle basin. These last uses are compatible with the proposed activity, and with regard to the water body projection zones, they are already contemplated within the restrictions of water courses.

Figure 42 - Water management of the POMCA of the Agua Clara channel



Source: EOT Villanueva, 2010, extracted from Control Ambiental Consulting, 2014.

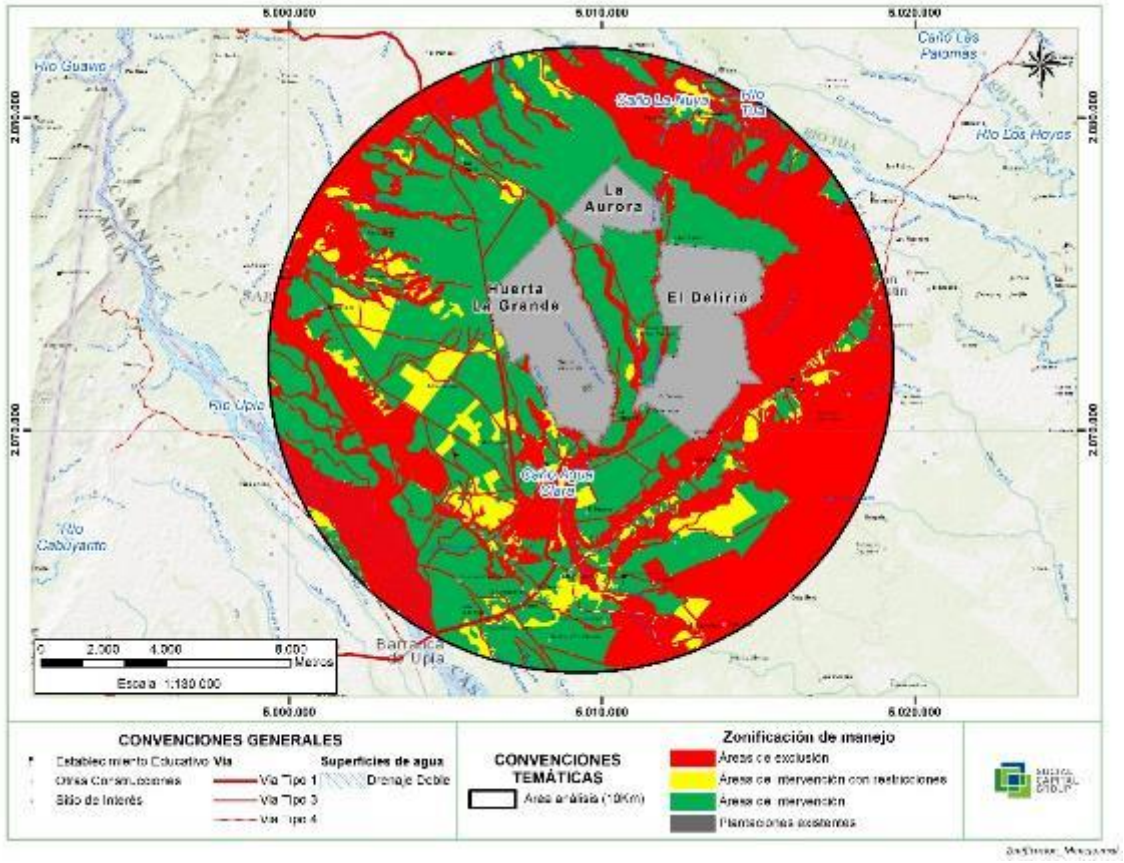
2.4 Consolidated constraint analysis

Once all the restrictions found had been analysed, they were consolidated in order to identify the real areas where the planned extension for planting an additional 200 ha could be carried out.

In this way, it was established that the area has 14,135 ha, equivalent to 51% of the analysis area, as exclusion areas (see Table 7.1); this means that approximately half of the area cannot be expanded in these zones. On the other hand, there are 11,750 ha in the area, where planting activities can be carried out, but only by private agreement with the landowner.

Figure 14 shows the spatial distribution taking into account each of the defined categories. In this way, it can be seen that there is a wide range of areas where expansion can be carried out, which are viable from an environmental, social and legal point of view. These areas are located both on the left and right side of the access road, as well as towards the northern part of the farms La Aura and El Delirio, which would be optimal places to carry out this expansion.

Figure 43 - Consolidated area of environmental, social and legal constraints



Source: CSG, 2021

Table 26 - Areas by restriction category

Category	Area	
	hectares	%
Exclusion areas	14.135,00	51%
Areas of intervention with restrictions	1.990,32	7%
Areas of intervention	11.750,14	42%
Total	27.875,46	100%

Source: SCG, 2021

3 GENERAL RECOMMENDATIONS

For the selection of the expansion area within the zones indicated in Figure 15 as possible restriction areas, the following social, environmental and legal risks should be assessed before any land acquisition process is initiated:

- Check that the title deed was duly acquired, that it is legal and valid.
- Ensure that the land is suitable for forestry activities and determine its plantable areas.
- Ensure that there are no encroachments and/or squatters and that there are no land claims.
- Identify sensitive environmental areas to set aside, exclude and conserve in the future (e.g. wetlands, gallery forests, etc.).
- Carry out a detailed mapping based on a satellite image, preferably with sub-metric resolution. Based on this image, it is recommended that baseline studies be carried out to identify in detail different aspects within the property that may have exclusions, such as groundwater sources (wells, cisterns or springs) or surface water sources from which families or dispersed population clusters may benefit.
- It is recommended to carry out a characterisation of the fauna and flora in the area of the property to be acquired, in order to identify wildlife movement corridors, the presence of endangered species of flora that require protection, and other critical elements at the level of these components.
- Conduct a social baseline to determine land uses, identification of landowners or other tenure categories, demographic, social, economic and cultural characteristics.

With the data and documents provided by the owners, a title analysis will be carried out by an external law firm to determine the legal viability of the acquisition.

The acquisition of land rights should be a voluntary process based on the principle of good faith between the parties, which recognises the voluntary intention of the owners to sell their land rights, under no circumstances shall coercion be used to effect the sale.

Easements or rights of way, whether legally constituted or not, must be respected so that the rights of way or passage of persons using them are not affected.

All financial agreements between the selling landowner and the company in charge of the forestry operation must be documented by means of a promise of sale contract and corresponding registration of the public deed.

Land that has one or more of the following characteristics should not be acquired:

- Pending succession proceedings.
- Where there was any possible violation of the human rights of individuals or communities.
- If ancestral rights of an indigenous community are affected.

Finally, it is important to note that, with the development of the project, in addition to the impacts listed in the ESIA, the most relevant impacts that will be caused are listed below:

Table 27 - Potential impacts identified

RISKS OR IMPACTS	
Environmental	Change in land use. (vegetation cover)
	Opening of access roads
	Fragmentation of vegetation cover
	Loss of functional connectivity for fauna and flora
Social	Possible physical displacement
	Possible economic displacement

Source: SCG 2021

For environmental impacts, it will be necessary to design management measures aimed at preventing or mitigating them, for which it is necessary to identify and leave as conservation areas, those areas that serve as connectors between natural areas in order to guarantee the flow of species between natural patches in the surroundings of the area to be intervened. This area should be at least 10% of the acquired area.

For social impacts it will be necessary to establish an involuntary resettlement plan that provides sufficient mitigation measures for the restoration of the livelihoods of the landowners from whom the land is acquired.